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# Fire and Life Safety for the Handicapped

CONFERENCE AND PREPARATORY WORKSHOP REPORTS

B. M. Levin, Editor

Supported by

Federal Emergency Management Agency,  
Office of Mitigation and Research, and the  
U.S. Fire Administration  
Washington, D.C. 20472



U.S. Department of Health, Education, and Welfare  
Bureau of Developmental Disabilities, and the  
Office of Facilities Engineering  
Washington, D.C. 20201



National Bureau of Standards  
National Engineering Laboratory  
Center for Fire Research  
Washington, D.C. 20234



February 1980

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## FIRE AND LIFE SAFETY FOR THE HANDICAPPED

Reports of

THE CONFERENCE ON FIRE SAFETY FOR THE HANDICAPPED  
Held at the National Bureau of Standards  
November 26-29, 1979

WORKSHOPS ON LIFE SAFETY FOR THE HANDICAPPED  
Held in Washington, D.C. and Sacramento, California  
August and September 1979

Supported by

Federal Emergency Management Agency  
Office of Mitigation and Research, and the  
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February 1980

**U.S. DEPARTMENT OF COMMERCE, Philip M. Klutznick, Secretary**

**Luther H. Hodges, Jr., Deputy Secretary**

**Jordan J. Baruch, Assistant Secretary for Science and Technology**

**NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director**



This report was prepared by the AIA Research Corporation and the Center for Fire Research of the National Engineering Laboratory, National Bureau of Standards. It is designed to be a comprehensive basic source document in the area of fire and life safety for the handicapped. As such, it contains a wide spectrum of ideas and opinions derived from various experts in relevant fields. The statements and conclusions in the panel and workshop reports represent a summary or synthesis of ideas presented by individual group members. Individual panel or workshop members may disagree with some of the statements contained in their own group's report.

The statements and conclusions in this report do not necessarily reflect the views of the Federal Emergency Management Agency, the National Bureau of Standards, or any of the other sponsors. No endorsement of any specific product or system is intended.



The Conference on Fire Safety for the Handicapped was sponsored by:

1. National Bureau of Standards-Center for Fire Research
2. Federal Emergency Management Agency
  - a. Office of Mitigation and Research
  - b. U.S. Fire Administration
3. Task Force on Life Safety and the Handicapped
4. AIA Research Corporation (American Institute of Architects Research Corporation)
5. U.S. Department of Health, Education and Welfare
  - a. Rehabilitation Services Administration/Bureau of Developmental Disabilities
  - b. Public Health Services
  - c. Office of Facilities Engineering
6. The President's Committee on Employment of the Handicapped
7. The Veterans Administration
8. The National Fire Protection Association

## ACKNOWLEDGMENTS

The contributions of many people and organizations were necessary to make this conference and the preparatory workshops successful. Their contributions are gratefully acknowledged, including those not specifically recognized below.

Many experts in a variety of fields worked diligently in the panels and in the workshops preceding the conference. Their contributions are the tangible output of the conference and most of the content of this report. The names of the members of the panels and workshops and the names of the officers are listed in this report.

Sharon Machida of AIA Research Corporation did a variety of editing, writing, and administrative tasks: the quality of her work was outstanding. Jo Ann Lorden, Margaret Harper, Omar Halmat, and their colleagues of the NBS Facility Services Division and Aaron Lucas and his printing staff cheerfully met our ever changing conference needs. Mat Heyman, Stanley Lichtenstein, Deborah Dwornik, and Raleigh Pinskey provided the publicity. Lora Kauffman, Elizabeth Van Lowe, Kathleen Magruder, Wanda Duffin, and Carol Gassaway of NBS and Donald Geis, Robert Sockwell, and Paul McClure of AIA Research Corporation worked through the night so that draft panel reports would be available for review on schedule. Brenda Avery typed the final report with severe time requirements.

The financial support of the U.S. Fire Administration in conducting the workshops and of the Office of Mitigation and Research in conducting the conference is directly attributed to the foresight of Phineas Anderson, Charles Boehne, and Cliff McLain. James Kerr and John Fannin, who were the Federal Emergency Management Agency (FEMA) project officers, provided valuable advice and administrative support. Ashot Mnatzakanian and Jonas Morehart of the Department of Health, Education and Welfare (HEW) assisted by arranging for HEW support for the conference.

The support and assistance of the NBS Center for Fire Research Management, especially Harold Nelson, Irwin Benjamin, and Frederic Clarke, and of the Task Force on Life Safety and the Handicapped, especially Howard Teich, Edmond Leonard, Edwina Juillet, Armand Burgun, and Peggy Smith, were invaluable and appreciated.

A special acknowledgment is given to Earle Kennett and Gretchen Bank of AIA Research Corporation. Earle Kennett directed the AIA Research Corporation project and personally assisted in many ways from the beginning of the planning through the preparation of this report. Gretchen Bank performed many administrative and editorial tasks for the workshops and the conference and in the preparation of the report.

Finally, recognized are the efforts of the NBS project staff: Norman Groner, Peggy Kunka, Jennifer Gagnon, and especially Roseanne Paulsen; her attention to the details of the conference and the needs of the participants was invaluable.

The National Fire Protection Association, the American Society of Mechanical Engineers, and the Washington Fire News Services graciously permitted us to reprint material from their publications.

## PREFACE

Many Americans are disabled to the point where their ability to cope with a fire can be considered impaired. These citizens are usually at a greater than average risk from fire except when they are segregated in institutions that provide custodial care and safety.

Society is modifying and eliminating the architectural and other barriers that have hindered the disabled's access to public buildings. Their increased presence in these buildings has made the potential problems of the disabled in fire emergencies more visible and has resulted in increased attention to the safety of handicapped persons by those responsible for providing fire safety.

While there is increased awareness of the problem, progress has been limited by: (1) relatively low public and professional concern with the problem, and (2) a lack of available guidance, knowledge and experience.

In the Spring of 1978, an ad hoc Task Force on Life Safety and the Handicapped was formed with the goals of increasing national concern about the problem and disseminating information about effective actions. While the Task Force is concerned about the safety of the disabled in all emergencies, fire safety was given priority. It was recognized that before a program could be undertaken to disseminate information about effective actions, it would be necessary to assemble and evaluate such information. One approach to obtaining evaluated information is to invite knowledgeable and experienced professionals to share their knowledge and experiences in seminars or workshops. This is the approach used in the Conference on Fire Safety for the Handicapped.

This report contains the results of the Conference and of a series of workshops conducted as part of the preparation for the Conference. This report is intended to be a valuable source document for a variety of people who have an active concern and responsibility for providing for the safety of the disabled in fire emergencies. It should also be an important document for those responsible for research priorities or who are interested in doing research in the area, and for those with policy type responsibilities.

In particular, the information in this report is assisting the Task Force on Life Safety and the Handicapped in proceeding toward its goals of increasing national concern about the problem and disseminating information about effective actions. The Center for Fire Research of the National Bureau of Standards is using it as a guide in developing a research program in that area.

The Conference was organized and hosted by the Center for Fire Research, National Engineering Laboratory, of the National Bureau of Standards but the active support and contributions of the co-sponsors were invaluable.

The AIA Research Corporation conducted a series of workshops as the major part of preparations for the Conference. The workshop reports served as the information base for the Conference participants. These reports have lasting value and are included in this report. Funding for conducting these workshops was provided by a grant from the U.S. Fire Administration of the Federal Emergency Management Agency to the AIA Research Corporation.

The AIA Research Corporation also provided invaluable assistance in the conducting and recording of the Conference and the preparation of this report. The cost of their efforts and the travel expenses of many of the participants were covered by a grant from the Office of Mitigation and Research of the Federal Emergency Management Agency. The U.S. Department of Health, Education and Welfare shared with the National Bureau of Standards the cost of conducting the Conference.

The ultimate success of the Conference and of the quality of this report is, of course, dependent on the capabilities of the participants at the preliminary workshops and at the Conference. Great care was exercised in developing panels of experts with good mixes of relevant backgrounds. Many knowledgeable people were consulted in selecting invitees to assure that we would invite only people of

acknowledged competence. A major criterion for selecting invitees was the need for relevant disciplines and interest groups to be represented on each panel: this mix of disciplines was maintained quite well at the Conference because a very large percentage of invitees accepted and attended.

The Conference and the Report are only first steps in assuring the fire safety of our disabled citizens. The Conference made clear to the participants that fire safety for disabled persons requires modifications, additions or other improvements to all aspects of the fire protection system. Many of the changes can be made with existing technology. Progress will come from many specific improvements rather than from any one dramatic change. Just as the Conference depended on the cooperative efforts of many organizations and of experts with varied backgrounds, future progress will depend on the ideas, programs and activities of a wide variety of organizations and individuals.

Bernard M. Levin  
Project Coordinator

Earle Kennett  
Project Coordinator

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## ABSTRACT

On November 26-29, 1979, the National Bureau of Standards hosted a Conference on Fire Safety for the Handicapped where 80 experts discussed the problems of the handicapped in fire emergencies, safety procedures, and hardware that upgrades their safety. The major work of the Conference was conducted by seven panels that met in parallel: overview, alarm systems, egress, refuge, self-protection, management actions, and emergency service actions.

Six workshops were held in preparation for the Conference during August and September 1979 in the area of life safety for the handicapped in emergencies. The workshops were: codes and standards, emergency preparedness planning, building design, education, consumer interests, and products. Each of the 13 panels and workshops prepared a report containing background information and the recommendations of the panels. This report contains the 13 reports, the speeches at plenary sessions and supplementary comments by some of the participants.

## INTRODUCTION

Recent progress in making public facilities available to the handicapped and in deinstitutionalization of the more severely handicapped has increased the need for greater efforts to ensure the safety of the handicapped in fire and other emergencies. Many experts from a variety of disciplines have been concerned with specific aspects of this problem. However, there has been no national forum or other opportunity where these experts have been able to exchange and evaluate information. This Conference on Fire Safety for the Handicapped was the first national conference where serious and concentrated attention was paid to the safety of the disabled in fire and other emergencies.

The conference was structured to maximize the exchange and the evaluation of ideas, possible "solutions," and experiences with specific "solutions" in the area of fire safety and the handicapped. The approach was to assign each participant to one of seven panels. Each panel was given a charge or assignment which is described later. Each panel discussed its assigned topic for two days with a view toward assembling information and developing recommendations for inclusion in a panel report. No formal papers were presented in the panel sessions.

It was recognized that the panels would be more productive if the panel members were provided with some general information about the topic prior to the meeting to supplement their expertise in specific areas. This was accomplished by conducting six workshops on six related topics during August and September prior to the conference and distributing the six workshop reports to the conference participants before the conference. The charge or assignment for the workshops is described later.

The participants in both the workshops and the conference were carefully selected and assigned. The workshop participants tended to be very knowledgeable about the specific topic under discussion. The conference participants were assigned to panels so that each panel would have participants with a broad range of backgrounds so that all ideas could be evaluated from a number of perspectives. The workshops and panels were kept relatively small (ten to twelve) to encourage the active participation of all members.

The workshop reports were prepared by the staff of AIA Research Corporation after the workshops were completed and the reports were reviewed by the workshop members. Each of the conference panel reports was prepared the night of the second day of panel deliberations. Each was written by the panel officers and an assigned staff member of the National Bureau of Standards or AIA Research Corporation. The draft panel reports were distributed to the panel members prior to the beginning of the third day of discussion. The third day of panel sessions was limited to 90 minutes and was directed toward accepting and modifying the draft reports.

All participants were given the opportunity to submit individual contributions that modify or clarify the panel or workshop reports. These submissions are included in this report.

It was, of course, impossible to invite all those who possess the desired qualifications. To increase the number who could participate, in general, the same persons were not invited to the workshops and the conference, with the exception of the workshop chairpersons and a few other participants who were invited to attend both in order to provide the necessary continuity.

The workshops and their charges were:

<u>Codes and Standards</u>	To concentrate on the adequacies, inadequacies and potential of codes and standards in ensuring the fire safety of handicapped individuals.
<u>Emergency Preparedness Planning</u>	To concentrate on the availability, development and use of emergency preparedness plans to assist in the protection and removal of handicapped individuals during emergencies.

<u>Building Design</u>	To concentrate on the capability of evaluating, using and developing building design practices, concepts, and guidelines to promote and provide for the fire safety of handicapped individuals. The scope covers new and existing buildings.
<u>Education</u>	To concentrate on the development and use of appropriate educational information, materials and techniques to promote fire safety for handicapped individuals.
<u>Consumer Interest</u>	To concentrate on the abilities, disabilities, needs, and desires of handicapped individuals in terms of providing for and promoting fire safety.
<u>Products</u>	To concentrate on the availability, need, use and future development of products and systems to assist in providing for the fire safety of handicapped individuals.

The Conference Panels and their charges were:

ALARM SYSTEMS:	To concentrate on the psychological and physical aspects of alerting and informing handicapped individuals and other persons during emergency situations.
EGRESS:	To concentrate on the psychological and physical aspects of the movement of handicapped individuals from danger to safety.
REFUGE:	To concentrate on the psychological and physical aspects of providing for areas of refuge for handicapped individuals.
SELF-PROTECTION:	To concentrate on the psychological and physical aspects of handicapped individuals providing for personal protection and performing specific fire safety duties.
MANAGEMENT ACTIONS:	To concentrate on the developmental, educational and implementation aspects of providing for certain managerial and planning actions that increase the fire safety of handicapped individuals.
EMERGENCY SERVICE ACTIONS:	To concentrate on the development and implementation by emergency services of appropriate actions that provide for the fire safety protection, rescue, and other needs of handicapped individuals.

**OFFICERS OF THE CONFERENCE ON FIRE SAFETY FOR THE HANDICAPPED**

Honorary Chairperson:                   **Mr. Max Cleland**  
   Administrator  
   Veterans Administration  
   Washington, D.C. 20420

Conference Chairperson:               **Dr. Frederic Clarke**  
   Director  
   Center for Fire Research  
   National Bureau of Standards  
   Washington, D.C. 20234

Project Coordinators:                 **Dr. Bernard Levin**  
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   Washington, D.C. 20234

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   Stutman & Rothberg  
   150 E. 58th Street  
   New York, New York 10022

Arrangements Chairperson:           **Ms. Roseanne Paulsen**  
   Center for Fire Research  
   National Bureau of Standards  
   Washington, D.C. 20234

Media Coordinator:                    **Mr. Mat Heyman**  
   National Bureau of standards  
   Washington, D.C. 20234

**CONFERENCE PARTICIPANTS**

Complete names, addresses, and telephone numbers are listed with the individual panel reports.

PANELS	ALARM SYSTEMS	EGRESS	REFUGE	SELF PROTECTION	MANAGEMENT ACTIONS	EMERGENCY SERVICE ACTIONS
CHAIRPERSON	.B. Cohn	R. Jensen	A. Burgun	J. Bryan	T. Rosenberg	J. Kerr
VICE-CHAIR- PERSON	D. Boyer	R. Mace	F. Bosak	C. Nicodemus	T. Lillis	J. Redden
MEMBERS	R. Bright J. Dowling K. Fresse F. Jameson R. Lynch I. Mandel M. Maxwell A. Mnatzakanian W. Tangye J. Zerde	J. Behrens R. McGaughey J. Pauls R. Pearson J. Reddersen N. Remmer D. Sibley	S. Adler G. Clark D. Belles F. Bourgin J. Degenkolb J. Lathrop R. Klinker A. Segal J. Shibe M. Slifka D. Watson	P. Anderson A. Cunningham G. Clark G. Dolim Z. Khachaturian R. Kirby H. Reitan C. Pfau T. Seymour R. Vreeland	A. van Bogaert A. Cunningham A. Gangnes E. Juillet V. Nickel H. Reitan W. Tomes M. Waller R. Wehrli	H. Boyd J. Brenner P. Favro D. Flinn G. Gray D. Hammerman R. Madden R. Rosenberry P. Smith H. Teich R. Wilson
RECODER	S. Machida	P. McClure	R. Sockwell	N. Groner	J. Gagnon	G. Bank
OVERVIEW COMMITTEE:	H. Nelson, Chairman J. Hawkins, Vice-Chairman D. Geis, Recorder	E. Fiorito J. Morehart J. Parker J. Persensky				

## WORKSHOP PARTICIPANTS

Complete names and addresses are listed with the individual workshop reports.

WORKSHOPS	CODES AND STANDARDS	EMERGENCY PREPAREDNESS PLANNING	BUILDING DESIGN	EDUCATION	CONSUMER INTERESTS	PRODUCTS
CHAIRPERSON	J. Dowling	E. Juillet	R. Klinker	P. Anderson	R. Mace	C. Nicodemus
MEMBERS	J. Burgun H. Boyd J. Degenkolb C. Everly E. Kennett H. Nelson T. Rosenberg P. Staudt B. Trant	J. Bishop J. Bryan R. Dotson H. Elderkin L. Fields E. Fiorito J. Hanson S. Israel E. Kennett B. Levin R. Rosenberry P. Smith	J. Bryan J. Bryan T. Goonan D. Hammerman E. Kennett N. Groner D. Hagner R. Lynch H. Nelson A. Phillips R. Wilson J. Surratt D. Thompson W. Whitehead	J. Brown R. Champion R. Dantona J. Gibson N. Groner D. Hagner F. Jameson E. Kennett J. Jameson E. Kunkel L. Gerken E. Kunkel F. Jameson R. Phillips C. Sabatier P. Smith N. Stone	F. Bourgin T. Fields E. Fiorito J. Gagnon L. Gerken E. Kunkel B. Levin R. Phillips C. Sabatier P. Smith	P. Favro J. Henderson F. Jameson G. Kunkel J. Kuns J. Persensky H. Schierenberg P. Smith R. Young
RECODER	S. Machida	S. Machida	G. Bank	S. Machida	G. Bank	S. Machida

Conference on Fire Safety for the Handicapped  
November 26-29, 1979

AGENDA

Monday - November 26, 1979

- 1:15 p.m. Meeting of Panel Chairpersons and Recorders
- 7:30 Welcoming Dinner
- 8:30 Welcome to NBS, Dr. John Lyons, Director, National Engineering Laboratory, National Bureau of Standards
- Comments by Earle Kennett, Programs Director, AIA Research Corporation
- Comments by Howard Teich, National Task Force on Life Safety and the Handicapped
- Keynote Address by John Leffler, Associate Deputy Administrator, Veterans Administration

Tuesday - November 27, 1979

- 9:00 a.m. Plenary Session
- Opening Remarks, Dr. Frederic Clarke, Director, NBS Center for Fire Research
- Recent Code Advances, Irwin Benjamin, Chief, NBS Fire Safety Engineering Division
- Reports of Summer Workshops, Chairpersons - James Dowling, Edwina Juillet, Richard Klinker, Phineas Anderson, Ronald Mace, Clarence Nicodemus
- 11:00 Panel Meetings

Wednesday - November 28, 1979

- 8:45 a.m. Panel Meetings
- 4:00 p.m. Chairpersons and staff prepare draft reports

Thursday - November 29, 1979

- 8:45 a.m. Panel Meetings - Discussion of Draft Reports
- 10:45 Plenary Session - Dr. Frederic Clarke, Presiding - Summary of Panel Reports
- 12:15 p.m. Adjourn

Office of the  
Administrator  
of Veterans Affairs

Washington, D.C. 20420



November 26, 1979



TO MEMBERS OF THE NATIONAL TASK FORCE  
ON LIFE SAFETY AND THE HANDICAPPED

I am sorry I am unable to be with you tonight and later as you pursue the important business of your conference on Fire Safety and the Handicapped.

President Carter joins me in wishing you well and has asked that I convey his hopes that your deliberations are both enlightening and productive and the conference is a success.

I am particularly grateful to you for designating me your honorary chairman. Obviously, I have great personal interest in the subject you meet to study and discuss and I look forward to learning what transpires.

As Administrator of Veterans Affairs and, thus, a representative of many thousands of handicapped Americans, I also have an important and abiding professional interest.

I wish you Godspeed and express my support and that of the Veterans Administration during your conference and in your subsequent activities.

A handwritten signature of Max Cleland, followed by his name and title.

MAX CLELAND  
Administrator

HOWARD TEICH  
CHAIRMAN, NATIONAL TASK FORCE  
ON LIFE SAFETY AND THE HANDICAPPED

NBS SYMPOSIUM  
November 26, 1979

THIS NBS CONFERENCE REPRESENTS FOR THE TASK FORCE THE ACHIEVEMENT OF AN IMPORTANT STEP TOWARDS ITS TARGETED GOAL OF PROVIDING THE CONTEXT FOR CREATING A LIFE-SAFE ENVIRONMENT FOR THE HANDICAPPED, WHICH WILL ALSO BENEFIT THE ABLE-BODIED COMMUNITY. AS THE SYMPOSIUM OPENS, I AM DELIGHTED TO WELCOME YOU ON BEHALF OF THE NATIONAL TASK FORCE ON LIFE SAFETY AND THE HANDICAPPED, AND TO THANK YOU FOR GIVING YOUR TIME TO THIS IMPORTANT ENDEAVOR.

THE IDEAS BEHIND THE TASK FORCE CAME TO FRUITION IN MARCH, 1978, WHEN A GROUP OF US MET IN WASHINGTON, D.C. TO DISCUSS THE MOST REALISTIC WAY TO CONCENTRATE PUBLIC ATTENTION ON THE SUBJECT OF LIFE SAFETY AND THE HANDICAPPED, AND THE BEST WAY TO COLLECT AND DISSEMINATE ALL AVAILABLE DATA. IN DECEMBER , 1978, A PLANNING CONFERENCE FUNDED BY THE USFA BROUGHT TOGETHER 25 PERSONS TO OUTLINE THE STATE OF THE ART, AND DEVELOP A STRATEGY FOR POOLING KNOWLEDGE IN THE FIELD.

THE WORKSHOPS THAT WERE HELD THIS SUMMER, AND THIS SYMPOSIUM ARE PART OF THAT STRATEGY, AND NOW WILL BE CARRIED OUT. WE ARE PLANNING ANOTHER SERIES OF WORKSHOPS AND SPECIAL RESEARCH PROJECTS FOR SPRING, 1980, TO FOLLOW THROUGH ON THE INITIATIVE OF THIS SYMPOSIUM, AND TO SET THE BASIS FOR A MAJOR NATIONAL CONFERENCE IN JUNE, 1980, TO DISSEMINATE THE GATHERED INFORMATION TO A MORE GENERAL, INTERESTED COMMUNITY.

THE TASK FORCE IS NOW IMPLEMENTING PLANS TO INSTITUTE A RESOURCES CENTER, ASSIST IN DEVELOPING INNOVATIVE PRODUCTS, PROGRAMS, AND CODES AND REGULATIONS, ESTABLISH AN OUTREACH PROGRAM PROVIDING SPEAKERS AT MAJOR NATIONAL CONVENTIONS AND BUILD A CONTINUING EFFECTIVE VEHICLE FOR GUARANTEEING LIFE SAFETY.

WHAT WE ARE AS A TASK FORCE IS YOU. WE ARE ALL OF US. WE ARE A GROUP OF INTERESTED INDIVIDUALS AND ORGANIZATIONS, GOVERNMENTAL AND NON-GOVERNMENTAL, WHO BANDED TOGETHER TO SHARE THE AWARENESS OF THE INCREASING INVOLVEMENT OF THE HANDICAPPED COMMUNITY IN OUR SOCIETY, AND THE INCREASED DANGER TO THEM OF UNMET EMERGENCY NEEDS AND/OR INACCESSIBLE OR INAPPROPRIATE MEANS FOR SAFE EGRESS. WE STARTED WITH AN IDEA, AND IT HAS GROWN.

FOR SEVERAL OF US, TONIGHT GIVES US A REAL SENSE OF PERSONAL JOY - FOR ED LEONARD, EDWINA JUILLET, RALEIGH PINSKEY AND MYSELF, WHO JOINED TOGETHER A YEAR AND ½ AGO WITH THAT IDEA, AND FOR BUD LEVIN, PHINEAS ANDERSON, JOE WILKES, JAMES DOWLING, AND ARMAND BURGUN, WHOSE INVOLVEMENT EXTENDS FROM THE FIRST MEETING OF THE

TASK FORCE. WE'VE EXPANDED, AND MET MONTHLY IN WASHINGTON SINCE THAT MEETING.

I WANT TO EXTEND SPECIAL THANKS TO CLARENCE NICODEMUS, RICHARD KLINKER AND OTHER MEMBERS OF THE TASK FORCE WHO CHAIRED THE SIX WORKSHOPS THAT FORMED THE BASIS FOR THIS SYMPOSIUM. BUD, THANKS FOR YOUR EFFORTS IN MAKING THIS SYMPOSIUM HAPPEN. PHINEAS ANDERSON AND PEGGY SMITH, FOR SETTING UP THE FUNDING FROM DCPA AND USFA FOR THE WORKSHOPS AND SYMPOSIUM. AND I WANT TO EXPRESS ALL OUR THANKS TO THE STAFF OF AIA RESEARCH CORPORATION AND PARTICULARLY TO EARLE KENNEDY, WHO NOT ONLY COORDINATED THESE EFFORTS, BUT WHO HAS CONSTANTLY BEEN THERE WITH HIS SUPPORT. ALSO SPECIAL THANKS TO CLIFF MCLAIN AT DCPA FOR HIS EFFORTS IN SUPPORTING AND ENLARGING OUR VISION OF THE TASK AT HAND.

THE TASK FORCE BELIEVES THAT PROVIDING FOR THE EMERGENCY NEEDS OF THE HANDICAPPED IS AN IDEA WHOSE TIME HAS COME, AND WE INTEND TO INSURE THAT THERE WILL BE CREATED AN ENTIRELY NEW ENVIRONMENTAL DESIGN IN OUR SOCIETY THAT PROVIDES A LIFE-SAFE ENVIRONMENT FOR NOT ONLY THE HANDICAPPED, BUT THE ABLE-BODIED COMMUNITY AS WELL.

THE TASK FORCE SHALL SUPPORT ALL ORGANIZATIONS WHO TAKE AN ACTIVE CONCERN IN THE EMERGENCY NEEDS OF THE HANDICAPPED, AND WILL HELP TO BRING TOGETHER ALL GROUPS WORKING IN THIS AREA.

A PERSON IN HIS LIFETIME DROPS A FEW SEEDS AND MOVES ON: IF THEY SHOULD TAKE ROOT, HE HAS SUCCEEDED. WE, ALL OF US, TONIGHT AND THIS WEEK, ARE JOHNNY APPLESEED PLANTING THAT SEED THAT I'M CERTAIN WILL GROW.

IN A CONVERSATION WITH BUD NELSON AT THE DAIS, HE CONCISELY STATED THAT WHAT MUST BE OUR THRUST AT THIS CONFERENCE, "TO ENTER EACH WORKSHOP WITH OUR KNOWLEDGE AND OUR BEST OPINIONS, AND TO BE WILLING TO LET A RESULT OR CONCLUSION COME OUT OF THE WORKSHOP THAT MAY BE BEYOND OUR EXPERIENCE AND BETTER THAN THE BEST OPINION OF ANY SINGLE MEMBER OF THE GROUP."

I LOOK FORWARD TO MEETING WITH ALL OF YOU OVER THE NEXT FEW DAYS, AND INVITE YOUR PARTICIPATION IN THE TASK FORCE GOAL OF WORKING TOGETHER TO CREATE A LIFE-SAFE ENVIRONMENT.

KEY NOTE ADDRESS  
JOHN J. LEFFLER

ASSOCIATE DEPUTY ADMINISTRATOR  
VETERANS ADMINISTRATION

IT IS A PARTICULAR PLEASURE FOR ME TO PARTICIPATE IN THIS CONFERENCE WITH YOU ON A SUBJECT SO IMPORTANT TO A LARGE PORTION OF THE AMERICAN PUBLIC. I WISH TO CONGRATULATE EACH OF YOU FOR YOUR DEDICATION, COMMITMENT AND CONCERN ON BEHALF OF SUCH A WORTHWHILE EFFORT. EACH IS HERE AS A RESULT OF AN INVITATION BASED ON HIS OR HER INDIVIDUAL EXPERTISE AND INTEREST IN LIFE SAFETY AND THE HANDICAPPED.

IT IS A PARTICULAR HONOR TO REPRESENT BOTH THE PRESIDENT OF THE UNITED STATES AND THE ADMINISTRATOR OF VETERANS' AFFAIRS AT THIS CONFERENCE. THEIR COMMITMENT AND SUPPORT FOR THE HANDICAPPED HAVE BEEN UNSWERVING THROUGHOUT THE YEARS. IN THIS REGARD, I WISH TO READ A LETTER FROM MAX CLELAND, ADMINISTRATOR OF THE VETERANS ADMINISTRATION, TO MEMBERS OF THE NATIONAL TASK FORCE ON LIFE SAFETY AND THE HANDICAPPED:

"I AM SORRY I AM UNABLE TO BE WITH YOU TONIGHT AND LATER, AS YOU PURSUE THE IMPORTANT BUSINESS OF YOUR CONFERENCE ON FIRE SAFETY AND THE HANDICAPPED.

"PRESIDENT CARTER JOINS ME IN WISHING YOU WELL AND HAS ASKED THAT I CONVEY HIS HOPES THAT YOUR DELIBERATIONS ARE BOTH ENLIGHTENING AND PRODUCTIVE, AND THE CONFERENCE IS A SUCCESS.

"I AM PARTICULARLY GRATEFUL TO YOU FOR DESIGNATING ME YOUR HONORARY CHAIRMAN. OBVIOUSLY, I HAVE GREAT PERSONAL INTEREST IN THE SUBJECT YOU MEET TO STUDY AND DISCUSS, AND I LOOK FORWARD TO LEARNING WHAT TRANSPiRES.

"AS ADMINISTRATOR OF VETERANS AFFAIRS AND, THUS, A REPRESENTATIVE OF MANY THOUSANDS OF HANDICAPPED AMERICANS, I ALSO HAVE AN IMPORTANT AND ABIDING PROFESSIONAL INTEREST.

"I WISH YOU GODSPEED AND EXPRESS MY SUPPORT AND THAT OF THE VETERANS ADMINISTRATION DURING YOUR CONFERENCE AND IN YOUR SUBSEQUENT ACTIVITIES".

MAX CLELAND, ADMINISTRATOR

THE SUPPORT FOR THE HANDICAPPED CONSTITUENCY HAS RECEIVED INCREASING EMPHASIS FROM THE PRESIDENT AND HIS ADMINISTRATION SINCE HIS INAUGURATION. IN ADDITION, THE ORGANIZATIONS AND AGENCIES PARTICIPATING IN THIS CONFERENCE DESERVE OUR RECOGNITION AND THANKS. THEY INCLUDE:

- THE AMERICAN INSTITUTE OF ARCHITECTS RESEARCH CORPORATION
- NATIONAL BUREAU OF STANDARDS - CENTER FOR FIRE RESEARCH
- DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
- THE PRESIDENT'S COMMITTEE ON EMPLOYMENT OF THE HANDICAPPED
- NATIONAL FIRE PROTECTION ASSOCIATION
- VETERANS ADMINISTRATION

VA REPRESENTATIVES WHO WILL PARTICIPATE IN THIS CONFERENCE ARE JIM LEFTER AND GUY CLARK, OFFICE OF CONSTRUCTION; AND BOB ROSENBERRY, DIRECTOR OF OFFICE OF EMERGENCY PLANNING, PLANNING AND PROGRAM EVALUATION.

THE DEDICATION AND ACTIVE PARTICIPATION OF SUCH GROUPS HAS RESULTED IN SIGNIFICANT CHANGES TAKING PLACE THROUGHOUT THE COUNTRY. THESE INCLUDE DEVELOPING AN APPRECIATION OF THE IMPORTANCE OF THIS GROUP WHICH INCLUDES THE BLIND, DEAF, THE IMMOBILE, THE AGED, AND MENTALLY DISABLED. IT ENCOMPASSES APPROXIMATELY ONE IN EVERY SEVEN AMERICANS TO INCLUDE OURSELVES, OUR FAMILIES, FRIENDS, FELLOW-WORKERS AND WOUNDED VETERANS. I FEEL PARTICULARLY FORTUNATE TO WORK WITH THEM BECAUSE OF THEIR ATTITUDES AND DESIRES TO CONTRIBUTE. IN 1968 I WAS HOSPITALIZED AS A RESULT OF INJURIES SUSTAINED IN VIETNAM. I WAS FORTUNATE TO BE ASSIGNED TO WALTER REED ARMY HOSPITAL AMONG SEVERELY DISABLED SOLDIERS. I WAS PARTICULARLY IMPRESSED BY THE CAPACITY OF THE PATIENTS TO RECOVER FROM BOTH THE MENTAL AND PHYSICAL INJURIES SUSTAINED IN COMBAT. WHILE THERE WAS NOT A WHOLE MAN PHYSICALLY IN THE GROUP, TODAY I KNOW OF NOT ONE OF THE BLIND, AMPUTEES, OR SERIOUSLY INJURED WHO HAS NOT RETURNED TO A PRODUCTIVE, EFFECTIVE LIFE. I'M SURE THERE ARE A FEW WHO HAVE NOT REACHED WHAT THEY CONSIDER THE PINNACLE OF SUCCESS; HOWEVER, EACH HAS REACTED POSITIVELY TO HIS PHYSICAL AND MENTAL PROBLEMS. THAT YEAR TAUGHT ME MUCH ABOUT THE DESIRE THE HANDICAPPED HAVE TO OVERCOME ADVERSITY THROUGH THE APPLICATION OF CREATIVITY, IMAGINATION, AND INNOVATION. I BELIEVE THE SUCCESS OF INDIVIDUALS CAN BE RELATED TO INDIVIDUAL LIFE-STYLES. THERE IS A SIGNIFICANT DIFFERENCE BETWEEN AN AMPUTEE AND A CRIPPLE -- MENTAL ATTITUDE IS ALL-IMPORTANT. EACH MEMBER OF THE HANDICAPPED COMMUNITY ADAPTS TO HIS ENVIRONMENT BASED ON HIS OWN INDIVIDUAL LIMITATIONS. WE CAN ASSIST THE BLIND, THE AMPUTEE, AND AGED TO PROVIDE SIGNIFICANT CONTRIBUTIONS TO THEIR SURROUNDINGS. RESULTS OF THIS CONFERENCE CAN HAVE A PROFOUND IMPACT BY PROVIDING A BASE WHICH SUPPORTS THEIR ABILITY TO FUNCTION IN AN OPERATIONAL ENVIRONMENT. SUPPORT DOES NOT MEAN MAJOR EXPENDITURES OF MONEY: THE FACILITY SUPPORT SERVICE OF THE VETERANS

ADMINISTRATION DEVELOPED ACCESSIBLE FACILITIES AND OFFICE EQUIPMENT WHICH ARE LESS COSTLY THAN REGULAR EQUIPMENT. I BELIEVE THAT BECAUSE OF THE VALUE OF THEIR FUTURE CONTRIBUTIONS TO THE NATION WE MUST PROVIDE THE ENVIRONMENT IN WHICH THE HANDICAPPED CAN EFFECTIVELY OPERATE. EACH OF US CAN CONTRIBUTE TO THEIR CAPABILITY TO OPERATE WITHIN THEIR INDIVIDUAL LIMITATIONS. YOUR INDIVIDUAL AND GROUP CREATIVITY AND INNOVATION IN ADDRESSING THE DRAFT REPORTS OF SIX RECENT WORKSHOPS (SPONSORED BY THE U.S. FIRE ADMINISTRATION AND CONDUCTED BY THE AIA RESEARCH CORPORATION AND THE TASK FORCE ON LIFE SAFETY AND THE HANDICAPPED) CAN DO MUCH TOWARD ESTABLISHING THE PATH FOR THE FUTURE.

AS YOUR FINDINGS AND RECOMMENDATIONS EMERGE FROM THIS CONFERENCE, I AM CONFIDENT THAT THE VA WILL RESPOND VIGOROUSLY TO ASSIST IN THEIR IMPLEMENTATION.

THE TASKS FACING US HERE ARE CHALLENGING. THIS CONFERENCE WILL BE SUCCESSFUL IF IT PROVIDES A BASE LINE THAT WILL SET A SOUND, SENSIBLE COURSE OF ACTION FOR THE FUTURE. NOT EVERY QUESTION HAS TO BE ANSWERED, BUT THE RIGHT QUESTIONS HAVE TO BE IDENTIFIED, PRIORITIZED, AND PROGRAMMED FOR FULFILLMENT.

FINALLY, I WISH TO EXPRESS THE VA COMMITMENT IN SUPPORT OF ASSOCIATED PROGRAMS. SIGNIFICANT IMPROVEMENTS ARE TAKING PLACE IN THE VETERANS ADMINISTRATION IN SUPPORT OF YOUR EFFORTS. MAJOR EMPHASIS HAS BEEN PLACED ON PROGRAM IMPROVEMENT IN VOCATIONAL REHABILITATION, CONSTRUCTION OF HOSPITALS AND OTHER PATIENT-CARE FACILITIES, AND IN EMERGENCY AND DISASTER PLANNING ACTIVITIES. I WOULD BE REMISS IF I FAILED TO MENTION WHAT THE VA IS DOING FOR VETERANS IN OUR REHABILITATIVE MEDICINE AREA FOR THE HANDICAPPED. OUR PROGRAM HAS BEEN STRUCTURED TO PROVIDE COMPREHENSIVE EVALUATION TECHNIQUES, PROGRESSIVE EXERCISE INSTRUCTIONS AND FOLLOW-UP IN VOCATIONAL AND SOCIAL SERVICES TO ASSIST EACH INDIVIDUAL TO ACHIEVE AN OPTIMAL LEVEL OF COMMUNITY LIVING. THESE PROGRAMS ARE DEVELOPED TO PROVIDE SUPPORTIVE ASSISTANCE COVERING THE VAST RANGE OF THE NEEDS FROM FAMILY COUNSELING, DRIVER TRAINING FOR HANDICAPPED PERSONS, EDUCATION, WORK THERAPY, AND JOB PLACEMENT, TO NAME JUST A FEW.

VA'S WORK PROGRAMS CONTINUE TO FOCUS ON THE SOCIAL PROBLEMS OF THE HANDICAPPED PERSONS, THE CHRONICALLY ILL, AND THE ELDERLY. INCREASED EMPHASIS HAS BEEN PLACED ON THE NEED TO DEVELOP MORE PRECISE MEASURES OF QUALITY CARE AND QUALITY OF LIFE IN COMMUNITY SERVICE PROGRAMS.

ADDITIONAL AREAS OF VA EMPHASIS INCLUDE:

- EMERGENCY AND DISASTER PLANNING
- CONSTRUCTION IMPROVEMENTS
- FACILITIES DESIGN TO PROMOTE ACCESSIBILITY

- ACTIVE PARTICIPATION IN OPERATIONAL ACTIVITIES:
  - CONFERENCE - REHABILITATION
  - ADMINISTRATOR'S PRIORITIES
  - ARCHITECTURAL AND TRANSPORTATION BARRIERS
  - COMPLIANCE BOARD
- PROGRAMS TO OBTAIN OPTIMAL LEVEL OF COMMUNITY LIVING:
  - REHAB MEDICINE
  - VOCATIONAL REHABILITATION
  - EMPLOYMENT

YOUR CONTRIBUTIONS TO THE RESULTS OF THE CONFERENCE CAN PROVE TO BE EXCEPTIONALLY VALUABLE IN THE FUTURE. THE VETERANS ADMINISTRATION, ALONG WITH OTHER AGENCIES IN THE GOVERNMENT, IS ANXIOUS TO PARTICIPATE WITH YOU IN THESE ACTIVITIES. THANK YOU FOR GIVING ME THE OPPORTUNITY TO PARTICIPATE WITH YOU ON THE OPENING DAY OF YOUR CONFERENCE. BECAUSE OF YOUR ATTITUDES, CONCERNS, AND INTERESTS, THIS CONFERENCE CANNOT FAIL.

State of the Art Pursuant to Life Safety in  
Buildings Made Accessible to the Handicapped

Irwin A. Benjamin

(The status of the promulgation of regulations by model code organizations, state governments and the Federal government where buildings used by the public are to be made accessible to the physically handicapped is presented. The paper also discusses the absence of regulations for providing for the safety of the handicapped under fire conditions in those buildings made accessible and identifies the status of various proposals by code and standards writing organizations which will correct this situation.

Key words: accessibility; architectural barriers; building codes; egress; elevators; life safety; model code organizations; NFPA; physically handicapped; standards.

ON OCTOBER 18, 1976, THE 94TH CONGRESS OF THE UNITED STATES PASSED PUBLIC LAW 94-541, KNOWN AS THE "FEDERAL ARCHITECTURAL BARRIERS LAW." SECTION 201 DESCRIBES THIS LAW AS

"AN ACT TO INSURE THAT CERTAIN BUILDINGS FINANCED WITH FEDERAL FUNDS ARE SO DESIGNED AND CONSTRUCTED AS TO BE ACCESSIBLE TO THE PHYSICALLY HANDICAPPED."

THE LAW FURTHER STATES IN PART THAT: THE TERM "BUILDING" MEANS ANY BUILDING OR FACILITY, THE INTENDED USE FOR WHICH EITHER WILL REQUIRE THAT SUCH BUILDING OR FACILITY BE ACCESSIBLE TO THE PUBLIC, OR MAY RESULT IN THE EMPLOYMENT OR RESIDENCE THEREIN OF PHYSICALLY HANDICAPPED PERSONS WHICH BUILDING OR FACILITY IS . . .

- (1) TO BE CONSTRUCTED OR ALTERED BY OR ON BEHALF OF THE UNITED STATES:
- (2) TO BE LEASED IN WHOLE OR IN PART BY THE UNITED STATES AFTER THE DATE OF ENACTMENT OF THIS ACT: OR
- (3) TO BE FINANCED IN WHOLE OR IN PART BY A GRANT OR LOAN MADE BY THE UNITED STATES.

OTHER SECTIONS OF THIS ACT MANDATE THAT THE VARIOUS DEPARTMENTS OF THE U.S. GOVERNMENT PRESCRIBE STANDARDS FOR THE DESIGN, CONSTRUCTION, AND ALTERATION OF BUILDINGS TO INSURE WHENEVER POSSIBLE THAT PHYSICALLY HANDICAPPED PERSONS WILL HAVE READY ACCESS TO, AND USE OF, SUCH BUILDINGS.

DUE TO THE ENACTMENT OF THIS PUBLIC LAW, THE EFFECTS ON THE BUILDING COMMUNITY ARE FAR REACHING. IN ESSENCE, EVERY BUILDING OPEN TO THE PUBLIC WHICH IS DIRECTLY OR INDIRECTLY FEDERALLY FINANCED OR OTHERWISE FEDERALLY SUBSIDIZED MUST COMPLY.

THE REFERENCE STANDARD IN GENERAL USE AT THE PRESENT TIME IS ANSI A 117.1 - 1961, "SPECIFICATIONS FOR MAKING BUILDINGS AND FACILITIES ACCESSIBLE TO, AND USABLE BY, THE PHYSICALLY HANDICAPPED."

IN GENERAL, ANSI A117.1 ADDRESSES SPECIFIC ARCHITECTURAL, SPATIAL AND BUILDING PLANNING CONSIDERATIONS FOR MAKING THE AFFECTED BUILDINGS ACCESSIBLE FOR THE HANDICAPPED AND SUBSEQUENTLY USABLE BY THE HANDICAPPED. THESE CONSIDERATIONS INCLUDE SUCH ITEMS AS:

- (1) THE ELIMINATION OF CURBS AND STEPS IN THE ACCESS ROUTES INTO BUILDINGS AT GRADE LEVEL;
- (2) PROVISION OF AT LEAST ONE ELEVATOR WITH DOOR OPENING AND CAR OF SUCH SIZE AS TO ACCOMMODATE A WHEELCHAIR AND CONTROLS DESIGNED TO BE ATTAINABLE AND USABLE BY WHEELCHAIR USERS AND BLIND PERSONS;
- (3) TOILET FACILITIES TO BE ACCESSIBLE AND USABLE BY PERSONS IN WHEELCHAIRS; AND
- (3) SLOPING OF RAMPS SO THAT THEY ARE USABLE BY PERSONS IN WHEELCHAIRS.

SUBSEQUENT TO THE ENACTMENT OF THE PUBLIC LAW, THE FOUR SO-CALLED MODEL BUILDING CODES, I.E., (1) THE BASIC BUILDING CODE PROMULGATED BY THE BUILDING OFFICIALS AND CODE ADMINISTRATORS INTERNATIONAL, INC.: (2) THE STANDARD BUILDING CODE PROMULGATED BY THE SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL, INC.: (3) THE UNIFORM BUILDING CODE PROMULGATED BY THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS: AND (4) THE NATIONAL BUILDING CODE PROMULGATED BY THE AMERICAN INSURANCE ASSOCIATION APPROVED CODE CHANGES WHICH PROVIDE IN VARYING DEGREES REQUIREMENTS FOR MAKING NEW BUILDINGS ACCESSIBLE TO THE HANDICAPPED BUT NONE HAVE MADE SPECIAL PROVISIONS FOR EVACUATION OF THE HANDICAPPED IN CASE OF EMERGENCIES.

THE NATIONAL BUILDING CODE IS PREPARED BY THE STAFF OF THE AMERICAN INSURANCE ASSOCIATION. SECTION 300.I.b OF THE 1976 NATIONAL BUILDING CODE ADDRESSES ACCESSIBILITY FOR THE HANDICAPPED AS FOLLOWS:

"WHEN BUILDINGS HAVE BEEN DESIGNED BY THE MUNICIPALITY TO HAVE SPECIAL PROVISIONS FOR PHYSICALLY HANDICAPPED PERSONS, THOSE BUILDINGS SHALL BE DESIGNED AND CONSTRUCTED TO CONFORM TO --- ANSI A117.1 -1961."

THE OTHER THREE MODEL BUILDING CODES, THE BASIC BUILDING CODE, THE STANDARD BUILDING CODE AND THE UNIFORM BUILDING CODE ARE THE PRODUCTS OF ORGANIZATIONS

WHOSE VOTING MEMBERSHIPS ARE BUILDING OFFICIALS. SPECIFIC REQUIREMENTS RELATED TO ACCESSIBILITY TO THE PHYSICALLY HANDICAPPED ARE NOT ADOPTED BY MAKING REFERENCE TO THE ANSI A117.1: BUT APPLICABLE REQUIREMENTS, APPROVED BY THE MEMBERSHIP, ARE WRITTEN IN DETAIL AND INCORPORATED INTO VARIOUS SECTIONS OF THE CODE.

BOCA'S 1978 BASIC BUILDING CODE, IN SECTION 315.0, SPECIFIES REQUIREMENTS APPLICABLE TO THE PHYSICALLY HANDICAPPED AND AGED. THE SECTION STIPULATES THAT THE REQUIREMENTS SHALL BE APPLICABLE TO "ALL LEVELS AND AREAS USED BY THE GENERAL PUBLIC, EMPLOYEES, PERSONS VISITING OR ON THE PREMISES FOR ANY REASON AND SHALL APPLY TO ALL USE GROUPS EXCEPT R-3, R-4 AND T." R-3 AND R-4 USE GROUPS ARE 1 AND 2 FAMILY RESIDENTIAL OCCUPANCIES AND THE T-USE GROUP INCLUDES TEMPORARY AND CERTAIN MISCELLANEOUS STRUCTURES.

SOUTHERN'S 1979 STANDARD BUILDING CODE ADDRESSES "ACCESSIBILITY FOR THE PHYSICALLY DISABLED AND/OR HANDICAPPED" IN SECTION 508, STATING THAT: "THE REQUIREMENTS OF THIS SECTION APPLY TO ALL LEVELS AND AREAS OF BUILDINGS AND STRUCTURES AND TO ALL OCCUPANCY CLASSIFICATIONS EXCEPT GROUP H "HAZARDOUS" AND EXCEPT SINGLE FAMILY STRUCTURES AND DUPLEXES OF GROUP R "RESIDENTIAL"."

SECTION 508 ALSO STATES: "THE PROVISIONS OF THIS SECTION NEED NOT APPLY TO BUILDINGS OR AREAS WITHIN BUILDINGS WHICH ARE FREQUENTED ONLY BY EMPLOYEES AND WHERE WORK WITHIN SUCH AREAS CANNOT REASONABLY BE PERFORMED BY THE HANDICAPPED, UNLESS SUCH AREAS LIE IN THE PATH OF EGRESS FROM AREAS NORMALLY USED BY THE HANDICAPPED."

AND, "BUILDINGS HAVE ACCESSIBILITY AT HABITABLE GRADE LEVELS, WHEN NO PUBLIC ELEVATOR IS PROVIDED, SHALL NOT BE REQUIRED TO COMPLY WITH THE PROVISIONS OF THIS SECTION AT FLOORS ABOVE SUCH LEVELS - -."

ICBO'S 1979 UNIFORM BUILDING CODE HAS THE MAJORITY OF ITS HANDICAPPED REQUIREMENTS INTERSPERSED THROUGHOUT CHAPTER 33 - "STAIRS, EXITS AND OCCUPANT LOADS". TABLE NO 33-A PROVIDES IN TABULAR FORM THE IDENTIFICATION OF THOSE USES WHERE ACCESS BY MEANS OF RAMP OR AN ELEVATOR MUST BE PROVIDED FOR THE PHYSICALLY HANDICAPPED.

IT IS OF IMPORTANCE TO NOTE THAT WHILE ALL FOUR OF THE MODEL BUILDING CODES PERMIT THE USE OF AN ELEVATOR FOR PROVIDING ACCESSIBILITY TO UPPER FLOORS BY THE HANDICAPPED THEY ALL PROHIBIT THE USE OF ELEVATORS AS A REQUIRED MEANS OF EGRESS AND DO NOT PROVIDE FOR ANY SPECIALIZED EMERGENCY EVACUATION MEANS.

AT ITS MEETING IN SAN DIEGO THIS PAST OCTOBER 30 THE FIRE AND LIFE SAFETY SUBCOMMITTEE OF THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS

RECOMMENDED THE APPROVAL AS REVISED OF A COMPLETE REWRITE OF CHAPTER 33 OF THE 1979 UNIFORM BUILDING CODE. THE SPECIAL COMMITTEE, RECOGNIZING THE PROBLEM RESULTING IN MAKING UPPER STORIES OF BUILDINGS ACCESSIBLE TO THE HANDICAPPED THROUGH THE USE OF ELEVATORS AND THEN NOT PERMITTING THE ELEVATORS TO BE USED AS REQUIRED MEANS OF EGRESS, SUBMITTED A NEW SECTION "33.3(g) BUILDINGS HAVING ELEVATORS". THIS NEW SECTION READS AS FOLLOWS:

"EVERY BUILDING HAVING AN ELEVATOR REQUIRED BY TABLE NO. 33-A SHALL HAVE EVERY BASEMENT AND EACH STORY ABOVE THE FIRST STORY DIVIDED INTO NOT LESS THAN TWO COMPARTMENTS BY NOT LESS THAN A SMOKE AND DRAFT CONTROL PARTITION MEETING THE REQUIREMENTS FOR A ONE-HOUR OCCUPANCY SEPARATION. ---EACH SUCH COMPARTMENT SHALL HAVE AN AREA CAPABLE OF ACCOMMODATING NOT LESS THAN 10 PERCENT OF THE FLOOR OCCUPANT LOAD OF THE FLOOR UPON WHICH IT IS LOCATED AT THE RATE OF 15 SQUARE FEET PER OCCUPANT. EACH SUCH COMPARTMENT SHALL CONTAIN A STAIRWAY OR ELEVATOR.  
EXCEPTIONS:

- (1) STORIES OPENING DIRECTLY TO GRADE;
- (2) STORIES HAVING RAMPS TO GRADE;
- (3) BASEMENTS USED SOLELY FOR THE SERVICE OF THE BUILDING;
- (4) BUILDINGS OR STORIES USED ONLY AS PARKING GARAGES."

THIS REQUIREMENT, IN ESSENCE, PROVIDES AN AREA OF SAFE REFUGE ON EACH FLOOR. THE 10 PERCENT OF THE OCCUPANT LOAD TO BE ACCOMMODATED BY THE AREA(S) OF SAFE REFUGE IS PREDICATED ON THE STATISTIC THAT 10 PERCENT OF THE POPULATION OF THE UNITED STATES ARE CONSIDERED AS PHYSICALLY HANDICAPPED. ANOTHER PUBLIC HEARING WILL BE HELD ON THIS PROPOSED CHANGE BY THE ICBO CODE CHANGES COMMITTEE IN MARCH OR APRIL 1980 AND IF A FINAL RECOMMENDATION FOR APPROVAL IS MADE TO THE MEMBERSHIP BY THE CODE CHANGES COMMITTEE, THE ACTION CAN BE INCORPORATED INTO THE CODE AT ICBO'S ANNUAL BUSINESS MEETING IN SEPTEMBER 1980 IN ALBUQUERQUE, NEW MEXICO.

NEARLY ALL OF THE 50 STATES HAVE ENACTED IN ONE FORM OR ANOTHER LAWS PROVIDING ACCESSIBILITY FOR THE HANDICAPPED TO PUBLIC BUILDINGS. WHILE MOST OF THE STATES' LEGISLATION FOR ACCESSIBILITY HAS BEEN ACCOMPLISHED BY REFERENCING ANSI A117.1-1961, THERE ARE SEVERAL EXCEPTIONS. CALIFORNIA, ILLINOIS, MINNESOTA AND NORTH CAROLINA ARE PRIME EXAMPLES OF STATES WHICH HAVE DEVELOPED COMPLETE

SETS OF REGULATIONS, GRAPHICALLY ILLUSTRATED WITH EXAMPLES OF COMPLIANCE WITH THE PROVISIONS OF THE REGULATIONS. IN GENERAL MOST OF THE LARGER U.S. CITIES ARE AFFECTED BY STATE REGULATION IN THIS REGARD. IT SHOULD BE NOTED THAT AS WITH THE MODEL BUILDING CODES, STATE REGULATIONS DO NOT ADDRESS EVACUATION OF THE HANDICAPPED ALTHOUGH THE REGULATIONS REQUIRE ACCESSIBILITY FOR THE HANDICAPPED.

THE LIFE SAFETY CODE COMMITTEE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, IN RECOGNITION OF THE PROBLEMS RESULTING WHEN BUILDINGS ARE MADE ACCESSIBLE TO THE HANDICAPPED, ESTABLISHED A SUBCOMMITTEE ON THE HANDICAPPED WITH THE SPECIFIC MANDATE TO INCORPORATE PROVISIONS FOR THE SAFETY OF THE HANDICAPPED IN EMERGENCY SITUATIONS. FRANK BOSAK WHO IS HERE, AND I, WERE NAMED AS CO-CHAIRMEN OF THIS SUBCOMMITTEE. THE SUBCOMMITTEE ADOPTED THE PHILOSOPHY THAT WHEN BUILDINGS ARE REQUIRED BY LAW TO BE MADE ACCESSIBLE TO THE HANDICAPPED THEN REGULATIONS MUST BE DEVELOPED THAT ADDRESS PROVISIONS FOR THE SAFETY OF THE HANDICAPPED IN AN EMERGENCY. THIS RESULTED IN A SET OF PROPOSED REVISIONS TO NFPA 101 LIFE SAFETY CODE WHICH PROVIDES FOR "MAINTAINING THE SAFETY OF EGRESS FOR THE HANDICAPPED." THE TWO KEY ITEMS IN THE PROPOSED REVISIONS ARE:

- (1) THE REQUIREMENTS ESTABLISHING A MINIMUM OF 2 AREAS OF REFUGE ON EVERY FLOOR BELOW AND ABOVE THE LEVEL OF EXIT DISCHARGE: AND
- (2) A SET OF PROVISIONS DESIGNED TO PROVIDE FOR THE SAFE USE OF ELEVATORS, SO THAT THEY MAY BE USED AS A POSSIBLE MEANS OF EVACUATION.

THE SECOND ITEM IS A RADICAL DEPARTURE SINCE ALL EXISTING EGRESS DESIGNS PROHIBIT THE USE OF ELEVATORS TO PROVIDE EGRESS FROM THE FIRE FLOOR UNDER EMERGENCY CONDITIONS. THE SPECIFIC DESIGN CONSIDERATIONS FOR THE SAFE USE OF ELEVATORS ARE PROPOSED IN THE APPENDIX OF NFPA 101.

THE PROPOSED AMENDMENTS TO NFPA 101, WHICH WERE RECENTLY BALLOTED, AND WILL APPEAR FOR PUBLIC COMMENT AS THE PROPOSED CHANGES OF THE COMMITTEE ARE:

#### 5-12\* SPECIAL PROVISIONS FOR THE SAFETY OF THE HANDICAPPED

5-12.1 EVERY NEW BUILDING HAVING A PASSENGER ELEVATOR SHALL HAVE EVERY FLOOR BELOW THE LEVEL OF EXIT DISCHARGE AND EVERY STORY SERVED BY SUCH ELEVATOR, EXCEPT THE LEVEL OF EXIT DISCHARGE, DIVIDED INTO NOT LESS THAN TWO (2) COMPARTMENTS BY NOT LESS THAN 1-HOUR FIRE RESISTIVE CONSTRUCTION. THE SMALLER OF THE COMPARTMENTED AREAS SHALL BE OF SIZE TO ACCOMMODATE 20% OF THE POPULATION OF THE FLOOR AT THE RATE OF 30 SQ. FT. GROSS AREA PER PERSON. EACH SUCH COMPARTMENT SHALL CONTAIN A STAIRWAY OR ELEVATOR.

EXCEPTION 1: STORIES OPENING DIRECTLY TO GRADE.

EXCEPTION 2: STORIES HAVING RAMPS TO GRADE.

EXCEPTION 3: STORIES USED SOLELY FOR THE SERVICE OF THE BUILDING.

EXCEPTION 4: FLOORS OR STORIES USED ONLY AS PARKING GARAGES.

EXCEPTION 5: ELEVATORS MAY BE USED IN LIEU OF THE AREA OF REFUGE IF THEY ARE  
DESIGNED TO PROVIDE REASONABLY SAFE EGRESS FROM THE BUILDING  
UNDER FIRE CONDITIONS.

EXCEPTION 2 TO SECTION 7.

EXCEPTION 2: IN NEW BUILDINGS, WHERE ACCESS FOR THE HANDICAPPED IS PROVIDED  
IN ACCORDANCE WITH SECTION 5-12, DESIGNATED ELEVATORS MAY BE  
USED FOR EXITING TO THE LEVEL OF EXIT DISCHARGE OR TRANSFER  
FLOOR. WHERE THIS PROVISION IS UTILIZED, THE ELEVATORS SHALL  
NOT BE USED FOR COMPUTING REQUIRED EXIT WIDTH.

THE PROPOSED REVISIONS FOR THE USE OF ELEVATORS CONTAIN SOME REQUIREMENTS WHICH  
WILL NECESSITATE REVISIONS IN OTHER NATIONALLY RECOGNIZED STANDARDS, SUCH AS THE  
NATIONAL ELEVATOR CODE ANSI A17.1. THE DESIGN CRITERIA CONTAINED IN THE APPENDIX  
OF THE LIFE SAFETY CODE ARE SUGGESTED PERFORMANCE CRITERIA AND AS SUCH ARE  
READILY SUSCEPTIBLE TO EQUIVALENCY DETERMINATIONS.

IN SUMMATION, THE RECENT ACTIONS TAKEN BY THE COMMITTEE ON SAFETY TO LIFE TO  
PROVIDE FOR EMERGENCY EXITING OF THE HANDICAPPED ARE THE FIRST PROVISIONS TO  
PROVIDE FOR THE SAFE USE OF ELEVATORS AS AN ALTERNATE TO OTHER MEANS OF SAFETY.  
EXISTING PUBLIC LAWS, STATE AND MUNICIPAL LAWS, AND BUILDING CODES HAVE TO DATE  
ONLY CONCERNED THEMSELVES WITH MAKING BUILDINGS ACCESSIBLE TO THE HANDICAPPED  
AND WILL HAVE TO BE AMPLIFIED TO PROVIDE FOR SAFE EMERGENCY EVACUATION.

## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held at  
The National Bureau of Standards  
26-29 November 1979

### OVERVIEW PANEL

7 December 1979

#### I. Scope

A common workaday premise that appeared among the panels was that all persons have an equal right to life safety in a fire emergency. Operating under this premise, the panels developed methodologies and strategies necessary to establish an environment in which people with handicaps can cope with a fire threat to life safety.

There was a pervading recognition of the need for total systems concepts in the solution of the life safety problems faced by handicapped persons in fires. All the committees recognized that there was no single unique solution to the problem and that protection of handicapped persons in fire emergencies requires an interactive approach involving interrelationships among: the building (including construction, use, protection devices and systems); the people housed in the building (both able-bodied and handicapped); the management of the building; the various institutions; (including government and codes and standards bodies) and the specialized services that support the building (including fire departments and rescue services).

Physical characteristics of the building and its protection system are prime determinants of the size and intensity of the fire threat and the provision of facilities to enable handicapped and other persons to escape from hazard to an area of safety. Various building systems interrelate with the building occupants to provide essential functions of communicating the presence of a threat, the nature of such a threat, and any additional information or directions they need in order to act for their own safety or to assist others. Of particular concern among the panels

was the provision of egress means and establishing safe areas of refuge.

In order for the installed systems to function effectively in providing safety it is necessary for each individual to be aware, understand and to take those actions which they are capable of to provide for their own safety as well as the safety of others.

#### 2. Problems and Issues

The preceding applies to any building situation whether or not handicapped persons are involved. Specific problems and issues raised by the panels that relate to accommodating and fulfilling the objective of enabling the handicapped to cope with and survive fire threats include the following.

##### 2.1 Lack of Data

A major problem in applying the current state-of-the-art technology to the problems of the handicapped occurs due to lack of data or information on:

2.1.1 The actual capabilities and limitations of handicapped persons, including functional characteristics, that would be needed to cope with fire or for which compensating features or devices would be required.

2.1.2. The number and distribution of handicapped persons likely to be found in buildings to the degree necessary to determine

the size, and quantity of protective features, spaces, or devices that are needed.

- 2.1.3. Factual data, histories, and other information on both the manner in which handicapped persons have been harmed and the manner in which they have managed to cope with fire.
- 2.1.4. Either the history or rational expectations related to the manner in which the efforts of a mixed population of handicapped and able-bodied persons interact with each other or their situational environment in manners that assist or impede the safety of all in a fire situation.

## 2.2 Building Codes

The occupancy classifications traditionally used in building codes do not fully account for the occupants' degree of familiarity with the facility or the extent of interrelationships among the occupants. A better understanding of the relationships between occupants and between the occupants and building elements is necessary for responsive fire safety codes.

## 2.3 Communications Systems

A need for requirements for emergency communications systems for buildings occupants and/or fire emergency service or other persons that will assist them was consistently stated as a problem.

## 2.4 Fire Emergency Plans

The lack of evacuation plans and drills organized to address the problems and needs of the handicapped was addressed by several panels.

## 2.5 Education and Training

Several panels were concerned over the lack of adequate education and training programs for professionals and the public (including handicapped people). The intent of these programs would be to create awareness of the special needs of the handicapped in fire emer-

gencies and to develop an increased capability to deal with these needs.

## 3 3. Recommendations

The above issues were treated by the individual panels as related to their specific charge. They made extensive recommendations relevant to:

- A. Involvement of handicapped persons in all phases of development, implementation, and evaluation of all elements of fire safety.
- B. Systems and devices which would allow communications relative to level of each and available safeguards, fire emergency notification, provisions of instructions and information and summoning assistance.
- C. Evacuation routes and refuge areas relative to the prompt removal of all persons from areas of immediate danger and eventual removal to areas of permanent safety, including the development of important concepts involving the degree of redundancy of egress paths and staging areas.
- D. Pre-planning as relates to the individual, the management fire services and other related organizations.
- E. Education and training, particularly as it relates to instructional manuals and background materials for both the individual handicapped persons, and for those who will be called upon to help or aid them.
- F. Design, maintenance, and upkeep of both the buildings, and their protection systems and devices; and of related educational awareness and training programs.
- G. Investigations, research, and information-generating activities to provide a better data base for future planning, decisions, and actions.
- H. Systems or approaches to permit the widest possible range of flexibility, cost control and alternative approaches in achieving fire safety objectives.
- I. Implementation recommendations addressed to Federal, state and local governments; code bodies; facility owners and managers; organizations

for the handicapped; manufacturers; fire departments and other emergency organizations; and individual citizens, both able-bodied and handicapped.

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## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held at  
The National Bureau of Standards  
26-29 November 1979

### PANEL ON ALARM SYSTEMS 30 November 1979

#### I. Introduction

The charge before the panel on alarm systems was concentrated on the psychological and physical aspects of alerting and informing handicapped individuals and others during fire emergencies. Although the term "alarm systems" has specialized connotations for those in the field, the panel addressed in its discussions all types of alarms, ranging from personal devices to automatic, self-contained systems for multi-storied buildings. The panel concentrated primarily on the physical aspects of alerting and informing handicapped individuals and others in the building upon whom the handicapped individuals would likely rely for assistance because these are the "most readily addressed through code revision". Psychological aspects of alarms were discussed in connection with many of the panel findings; the panel recommended further study in the area of perception of different types of alarms.

Early in panel deliberations, the following functions of alarm systems were identified:

1. Initiation and detection (automatic and manual);
2. Notification
3. Communication (supplementary);
4. Auxiliary function (e.g., recapture of elevators, shutting fans, closing fire doors).

The panel felt that only notification and supplementary communication were within its purview. Initial notification signals were assumed by the panel to carry the implicit message "evacuate

immediately." Supplementary communications are any messages or instructions beyond immediate evacuation.

The panel first attempted to define the populations alarm systems should be expected to alert and inform. Who is it that alarm systems must reach? The panel initially felt that alarms should have the capability of notifying all occupants of any particular occupancy type. By the end of the first day of discussion this was revised to "every person who is expected to take independent action in a fire emergency." The basic premises of the definition agreed on can be described briefly as follows:

- 1) No alarm system can be expected to reach every occupant of a building. There will always be a few occupants who, due to some incapacity to receive and understand the fire alarm signal (e.g., deep sleep, inebriation, distance from signals, drugs) cannot be alerted by any combination of audible, visual or tactile signals.
- 2) Of those that can be reached, not all need to or should be. For example, a hospital floor far removed from the fire floor and occupied by non-mobile patients may not have to be notified; the potential adverse psychological effects may outweigh the benefits of notifying the entire hospital of the existence of a fire. The groups who would not be notified should be determined by occupancy type and code guidelines.

After the initial alert has been accomplished, there are many problems related to providing adequate information on evacuation or movement to areas of refuge to both handicapped and able-bodied occupants of a building. These

problems are inextricably bound to conditions related to fire safety education, previous emergency training and experience, the design of the building--in particular, corridors, doors, refuge areas, elevators and stairwells--and many other factors. In dealing with these problems the panel felt that comprehensive, coordinated, and simultaneous efforts must be made by all related disciplines and fields to overcome unnecessary duplication and excessive cost in order to maximize and ensure the quality of services responsive to the needs of the handicapped and the able-bodied.

This paper presents, first, the problem areas identified at the beginning of the panel meeting. These are followed by the panel's findings and observations regarding specific needs and considerations related to different types of disabilities and occupancy types. The paper concludes with findings and recommendations representing the panel's suggestions on realistic courses of action.

## 2. Problem Areas

Within the areas of notification and supplementary communication the following functions were identified:

- o Alerting the occupants of the building, the management, and the fire service of the existence of a fire;
- o Giving guidance for evacuating the affected area;
- o Calling for help by the handicapped individual to the management and/or fire service personnel;
- o Providing additional information or guidance to the occupants by building management or fire service personnel.

These functions can be performed by:

- o Appropriate alarm systems (including smoke detectors, manual and automatic notification systems, zoned communication systems, pre-recorded messages);
- o Signage and other exit identification;
- o Personal alarm and communication devices;
- o Fire service equipment;
- o Assistance from other occupants.

These identified functions provided a structure for identifying problem areas.

The panel analyzed all observations, problem areas, and recommendations related to alarms systems identified by all six of the Workshops on Life Safety and the Handicapped. Particular attention was given to the problem areas identified by Workshops 2 and 6.

Specific problem areas identified by the panel were:

1. The steady non-coded signal inhibits communication between building occupants.
2. Any audible system may disorient the blind who depend on normal building noises for navigation.
3. Current audible alarms are non-directional.
4. There may be a need for both audible and visual signals above exits.
5. Present directional signs are intended for the sighted and English-reading.
6. The existence of obstructions to safe egress is not communicated to the visually-impaired and the blind by present alarm systems.

## 3. Specific Needs and Considerations

The panel then turned its attention to identifying the alarm needs of persons with certain handicaps in the building environment. It was pointed out that it is useful to divide the total built environment into four subgroups: living, learning, working, socializing. It was determined that this type of classification closely parallels the occupancy classification used by the building codes, and it was decided to utilize the product-oriented matrices developed by Workshop 6 for analysis of this problem area. The nine occupancy groups were listed along the top in order approximating the groups comprising the built environment. The vertical divisions of the matrix as listed in Figure 2, Workshop 6, were retained for identifying disability types. The completed matrix as prepared by this panel for the initial notification of a fire emergency in the building is given in Figure 1. As indicated earlier, it had been decided that the fire alerting signal is useful only to the person who is capable of self-help in evacuation (or relocation), and Figure 1, thus, is limited to notification of all persons who are expected to take independent action in a fire emergency. Furthermore, it was assumed that products or systems currently being utilized for fire alarm purposes suit the needs of the able-bodied; identification of general short-

comings in certain applications was considered beyond the scope of this conference.

Plus signs (+) indicate that either the products now being used in that occupancy group are acceptable for the type of disability indicated or that a suitable product is available and acceptable for the purposes. A check mark (/) indicates that suitable products for alerting persons with this type of handicap are available but there is a need for standardization and/or more work to make them fully acceptable. A minus sign (-) was to be used if there is no product currently available to satisfy (as is or modified) the needs of persons with that type of disability, but no such deficiency was identified.

For purposes of fire alerting, a check mark was used in Figure 1 to indicate that while there are a variety of methods available to alert the hearing-impaired, there has been insufficient standardization.

The second matrix (Figure 2) was used to analyze systems of providing supplementary information which a person might need in order to reach a place of safety. Ordinarily, exit signs and directional signs are the most common ways of imparting this guidance.

For three types of disabilities - movement-impaired, strength-impaired and life-support-equipment-hindered - existing by means of stairways may be impractical, and these persons may have to be directed to a place of refuge or other location. The development of a new, standardized sign for directing people to the place of refuge appears to satisfy the need.

In only a few instances was it believed that those with severe vision handicaps would have difficulty in locating exits. Where these persons are familiar with their surroundings and even in transient residential situations, the blind can be expected to need no extraordinary guidance. However, in certain complex situations, such as large stores, factories, warehouses, restaurants, theaters, etc., additional guidance may have to be provided. Products which can be used for or adapted to this need include tactile tapes and signs, audible or homing devices at exits, and "talking lights" (referred to in the Workshop 6 paper). In addition, voice instructions may be practical to have non-handicapped assist the blind.

Another identified need for products was in the area of one-way and two-way communication, personalized to the specific capabilities and needs of the individual. Products now available which appear to be capable of satisfying this need are tactile alarm watches triggered by the fire alarm system, digital transmitters in each room triggered by hand-held devices, vibrators placed under beds, portable radios, pagers, directional signal

transmitters, etc.

#### 4. Findings and Recommendations

The following are the findings and recommendations arrived at by the panel. Although cost factors were considered, the panel recommends cost benefit analysis of the different alarm strategies suggested.

1. Where a fire alarm system is required, every person who is expected to take independent action in a fire emergency should be alerted by a distinctive signal. For most persons, either an audible or a visual signal is satisfactory. Using both types of signals together may provide only slight additional coverage. Personalized signals utilizing any of the five senses may be the most suitable for those not able to be alerted by the audible or visual signals being used in the building.

##### Notes:

- a. It is intended that the fire evacuation signal need not be received by those who cannot take independent action in a fire emergency. It may be desirable to communicate the nature and extent of the emergency to these individuals.
- b. Where persons with hearing disabilities are in rooms where they can be alerted by others, no special alerting devices are needed.
2. Persons having been alerted by the distinctive fire alarm signal are assumed to know that they should evacuate the building. The handicapped may be obliged to remain in place and should have means to communicate that location to firefighters, or they may have to evacuate or relocate to a designated place of refuge. The place of refuge should have standardized distinctive visual identification and two-way communication.
3. Where directions are needed to locate the exits or places of refuge, a combination of methods can be used to inform all persons of the locations. Suitable methods include signage with and without tactile surfaces, alarm systems with voice capabilities, public address systems meeting the specialized requirements of fire alarm systems, personalized instruction modules, guidance from others, directional lights, etc.
4. Present exit signs have limited effectiveness under marginal conditions. Strobe

- lights near the floor and clear red or green lights have been identified as being more visible.\* When pulsed together with an audible signal upon initiation of the fire alarm system, more effective guidance may be given to all persons. This concept should be investigated. (see also II)
5. Most people who have a need to use fire alarm boxes to notify others of a fire emergency have access to those now in use, provided they are mounted not over 54 inches above the floor. Special accommodations for operation of the boxes by the visually-handicapped are not required, but standardizing the shape, color, texture, operation, and location of fire alarm boxes should be considered. The color orange is recommended for fire alarm boxes, based on studies indicating that orange is the last color that remains distinctive as the visually-impaired approach total blindness.
  6. Development is needed for a personalized emergency call device with homing capabilities for those who may not be in a fixed location in a building and who are unable to use normal communication facilities.
  7. In low-rise residential buildings, an audible or visual signal initiated by the person in distress is desirable on the outside to alert neighbors to the need for emergency assistance. An important element in such an arrangement would be prior planning with neighbors. In other residential buildings, enunciated signals are desirable for the same purpose.
  8. In transient residential occupancies, the handicapped should be informed on actions to be taken in a fire emergency. (The means for effectively accomplishing this were considered to be beyond the scope of this panel.)
  9. Visual, audible, and tactile signals should be simplified and standardized.
  10. Products used for fire alerting and conveyance of information should conform to minimum acceptance criteria.
- II. Continuous audible fire alarm signals limit interpersonal communication during a fire emergency, may be distracting, and may cause adverse psychological and behavioral responses. The desirability and feasibility of intermittent audible signals should be investigated, as should the placement of audible signals at exits to guide the visually handicapped and others under poor visibility conditions. (see also 4)
12. The panel endorses recommendations I and 6 of Workshop 6. Recommendation I calls for the development of a rehabilitation engineering products catalog focusing on those products that would enhance life safety. Recommendation 6 calls for continued and increased public education at all levels on the need for life safety products and in training in product use.

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\*Human Engineering Considerations in Exiting from Secure Spaces, Report No. 7762-2, prepared for the U.S. Navy Civil Engineering Laboratory by Gage Babcock and Associates, March 1978.

Figure 1. Notification of Building Occupants

Disability Type	Occupancy Type	Residential 1 & 2 Family							
		Residential Other	Institutional	Educational	Business	Mercantile	Factory/Industrial	Storage	High Hazard
1. Movement	+	+	+	+	+	+	+	+	+
2. Manipulation	+	+	+	+	+	+	+	+	+
3. Hearing	/	/	/	/	/	/	/	/	/
4. Vision	+	+	+	+	+	+	+	+	+
5. Voice	+	+	+	+	+	+	+	+	+
6. Mental	+	+	+	+	+	+	+	+	+
7. Life Support	+	+	+	+	+	+	+	+	+
8. Emotional	+	+	+	+	+	+	+	+	+
9. Hidden	+	+	+	+	+	+	+	+	+
10. Size	+	+	+	+	+	+	+	+	+
11. Strength	+	+	+	+	+	+	+	+	+

Living	Learning	Working	Socializing
[ ]	—	[ ]	—

**Key**

+ = Products Available  
 / = Product Development or Standardization Needed

## Figure 2. Supplementary Communication

Key

+ = Products or Systems Available  
/ = Development or Standardization Needed

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ref: Conference on Fire  
Safety for the  
Handicapped, Nov-  
ember 26 - 29, 1979.

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Dear Dr. Levin:

Below are my comments on the report of the PANEL ON ALARM SYSTEMS.

There are three major areas of the Panel findings that I feel need clarification:

1. ..."fire evacuation signal need not be received by those who cannot take independent action." (ref. item 1. page 3 and 4 and discussion, bottom page 6.) \*

I take strong exception to the assumption that only those who are "expected to take independent action" need be alerted. Perhaps I am misinterpreting the statement, but I cannot conceive of a situation in which I would choose not to be given as much information, as many alternatives and as much time as possible in facing a fire related emergency, whether or not I could take independent action. A clarification of this point is necessary!

The opportunity of choice must be given to each and all persons.

2. ..."products or systems currently being utilized for fire alarm purposes suit the needs of the able-bodied;..." (ref. bottom page 6.) An exception on this point appears to be minor on the surface, but in reality it strikes at the very heart of the issue involved. Through the process of analyzing and itemizing the functional tasks required during a building fire emergency (for the purposes of describing the functional assistance needed by disabled persons), it has become clear to me that the so called "able-bodied" are actually scarce in a fire and smoke involved environment. Smoke reduces vision; carbon monoxide reduces physical capacity; noise and commotion reduces logical thought and orientation; anxiety reduces understanding of simple instructions; minor injury reduces physical ability.

Therefore, current products do not meet the needs of the able-bodied in a real emergency. We cannot make assumptions to the contrary in this regard because it leads to a false conclusion

that all of our efforts are aimed at "providing for needs of the few". In reality, we are clearly just now considering the needs of the able-bodied as well as the disabled person.

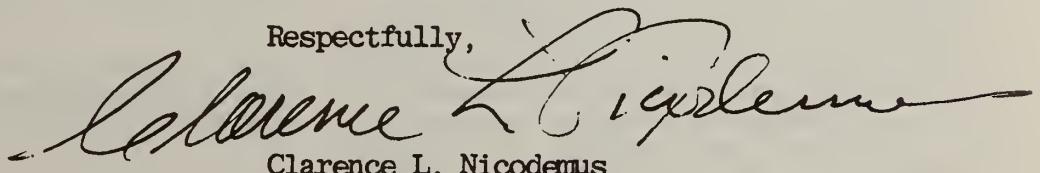
3. "Technology is available, so a product cannot be far behind." Although this is not a direct quote from this Panel's report, it is often expressed and I feel that it is appropriately addressed here where the discussion of needed products takes place.

Because technology exists for the development of products for alarm systems, personal devices etc., it cannot be assumed that they will be developed. Products must go through a considerable number of stages before being delivered to the market:

1. The initiation of this effort takes "up front" monies which can be highly speculative and therefore hard to find and justify.
2. Development of performance criteria or specifications. These are the guidelines for the product's performance and agreement or consensus is difficult to achieve.
3. Research and Development. Prototype design, test, redesign to obtain a reliable product that performs as specifications require.
4. Prototype manufacture for field test which may lead to mass production.
5. Market surveys, financing, advertising, etc.
6. Education and training in use which may lead to acceptance by users.

All this must occur before it can be assumed that the product is available. Therefore, when discussing the availability of products based on available technology, it must be borne in mind that a great deal of time, effort and money must be expended before the transfer is realized. We must not be " lulled" into non-action because of the mere availability of technology.

Respectfully,



Clarence L. Nicodemus

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NOTES

## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held at  
The National Bureau of Standards  
26-29 November 1979

### PANEL ON EGRESS 29 November 1979

#### 1. Scope and Basic Premises

The Panel on Egress concentrated on the behavioral and physical aspects of moving handicapped people from areas of danger to areas of safety. The Panel considered both horizontal movement on a single level or building story and vertical movement between levels.

The Panel found it had insufficient time to give detailed consideration to a major problem--retrofitting existing buildings. It was recognized that to some extent this is part of the larger problem of retrofitting buildings to be accessible to handicapped people in the first place.

Nor was time available to consider the important behavioral issue of emergency egress from private homes. Handicapped people's special concerns for their loved ones can be expected to influence their risk-taking and decision-making behavior and, thus, their egress time. The Panel hopes that these and related matters will receive adequate attention in other forums.

Two fundamental premises guided the Panel's deliberations:

- o Buildings that are required to be accessible to handicapped people should also provide them with safety during fire emergencies.
- o The level of safety provided handicapped people should equal, as nearly as possible, that provided able-bodied people.

#### 2. Fire Data Needs

Early in the course of the Panel's discussions it was recognized that information on handicapped people's experiences in fire emergencies in the past is not readily available. This sort of information exists, but is buried in the much larger body of data on able-bodied people.

Such information, if compiled, would help determine the most important safety issues to investigate and the areas most likely to offer cost-effective fire-safety investments. However, while calling for the compilation of such data the Panel noted, first, that available research indicates that in some situations data from fire drills and other simulated situations are useful indicators of behavior in actual fire emergencies. Second, the Panel stressed that the lack of complete information of this sort should not impede implementation of safety features that available information indicates will be effective. We should, in other words, move to prevent future fire disasters now instead of waiting for their occurrence to confirm otherwise well-grounded theories about their possibility.

#### 3. Behavioral Aspects of Egress

The Panel's confidence in our ability to act now to improve fire safety for handicapped people is based on the useful, if preliminary, behavioral research results presently available. This research, sponsored by the National Bureau of Standards, the National Research Council of Canada, the National Fire Prevention and Control Administration, and others, offers

valuable information--some of it counter-intuitive--on protecting both able-bodied and handicapped people.

The idea that data on able-bodied people can be of use in protecting handicapped people may itself sound counter-intuitive. However, many of the recommendations in this Panel's and the other panel's reports are directed at compensating for people's handicaps, leaving them, for fire safety purposes, "able-bodied." Providing fire-safe elevators for people in wheelchairs or visual alarms for deaf people, for instance, permits safety planners to focus on other emergency needs during a fire, needs that handicapped and able-bodied people share alike.

The available behavioral data on fire safety--some published and some not--need to be disseminated, studied, and discussed much more widely than they have been to date. The following examples suggest their range and potential value:

- o People in fire emergencies tend to use egress routes with which they are familiar. This suggests that building designs and management plans should work to encourage occupants to use fire-safe egress routes as a matter of course. Daily stair usage has been found to increase significantly for instance, when stairwells are well-lit and attractively decorated.
- o People with cognitive disabilities such as those associated with mental retardation and senility are able to learn and remember the location of stairs more easily if the stairwell doors they pass on a daily basis have vision panels that, by allowing a view of the stairs, reinforce the message of often disregarded "EXIT" signs.
- o In many fire emergencies the majority of time elapsed between the sounding of an alarm and escape is spent interpreting the situation and deciding what to do. This not only confounds efforts to base fire-safety codes and standards on actual travel times but indicates the importance of providing effective, unambiguous alarms and pre-ignition egress instructions.
- o Studies of office towers and public assembly places indicate that people with a variety of handicapping conditions can evacuate down or up stairs along with everyone else without impeding overall egress significantly, although some need assistance (e.g.,

those in wheelchairs being carried out by others).

Clearly, these and other results from the research community offer much of value to fire-safety planning.

#### 4. Physical Barriers to Egress

It is reasonable to expect that providing handicapped people barrier-free access to buildings will go a long way to enabling them to egress from dangerous areas during a fire emergency. The Panel determined that, with important exceptions, this is the case. For this reason the Panel welcomes the American National Standards Institute's recent revision of its 1961 standard, Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped (ANSI A117.1-1961). The revised standard provided detailed guidance on the state-of-the-art of barrier-free design, and should be considered carefully by designers, facility owners and administrators, regulators, and codes and standards officials.

The Panel noted several areas in which the new ANSI standard either conflicts with existing building and life-safety codes, goes beyond them, or does not itself appear to provide optimal life-safety solutions. The following examples are among those that came to the Panel's attention.

- o Vision panels in doors, as discussed in the previous section, are useful for stairwell doors and all other doors where privacy, for example, is unnecessary. (Several Panel members noted that vision panels are also of value to able-bodied people, both in fire emergencies and under normal circumstances.)
- o The revised ANSI standard calls for doors that open in response to no more than 8½ lbs. of pressure to enable weakened people or those with limited coordination to use doors easily. It is widely believed, however, that achieving this goal for fire doors would decrease sharply their ability to self-close and self-latch; as a result, the ANSI standard specifically exempts fire doors. Efforts should be continued to develop fire doors and hardware with opening and closing characteristics that ensure they can be operated by handicapped people but still serve their purpose as fire doors.
- o Codes and standards should provide a 32" clear egress path for wheelchairs through doors as recommended by the new ANSI standard. Doorways with multiple leaves can achieve this with

any single active door leaf.

- o Egress ramps for use by handicapped people should meet the 1:12 slope recommended by ANSI.
- o The ANSI corridor-width standard might be studied to evaluate the need for increasing corridor-width, especially in dead-end corridors, to 48" to enable wheelchairs to turn around easily. The smaller width can be workable under normal circumstances because people in wheelchairs can turn into doorways off a corridor to gain room to turn around. In a fire the doorway and time to get to it may not be available.
- o Dead-end corridors can rob people not familiar with the building's layout, both the able-bodied and the handicapped, of valuable egress time trying to locate an exit.
- o Specifications should be more fully developed to minimize traction and trip hazards on floors, ramps, and stairs.
- o The new ANSI standard for stair design does not apply if an elevator or other accessible mechanism for vertical movement is available. Because using stairs may be necessary in a fire emergency for both able-bodied people "handicapped" by stress and for people with non-ambulatory handicaps, the ANSI standard should apply to all stairs.

These and other features of the new ANSI standard and building and life-safety codes require careful detailed examination to ensure maximum safety in fire emergencies.

## 5. Elevators in Fire Emergencies and Other Egress Options

As stated in the beginning of this report, the level of fire safety accorded handicapped people should, as nearly as possible, equal that accorded able-bodied people. A basic premise of traditional fire-safety planning has been the importance of providing two egress routes to avoid entrapping occupants in a dangerous area if the fire makes one of the routes unusable. The new ANSI A117.1 standard discussed above, however, calls for only one accessible route to avoid what are considered excessive costs and design features. Moreover, the ANSI standard indicates that this single means of vertical movement can be provided by elevators, the use of which has

traditionally been avoided in fire emergencies. How can this dilemma be resolved?

The Panel resolved that redundancy -- at least two means of egress -- should nevertheless be provided for handicapped people. The first means should be the accessible route called for by ANSI, and if it includes elevators they should be fire-safe, as discussed below. The second means of egress can take one of several forms, depending on the nature and occupancy of the building:

- o Accessible refuge areas can be provided on each level to make vertical movement unnecessary. The Panel on Refuge presents a detailed discussion of this subject.
- o Assistance plans such as buddy-system, fire wardens, and other pre-planned management options can be developed in which able-bodied people help handicapped people use stairs and other non-accessible egress routes. Such plans should be evaluated very closely, however, to ensure their effectiveness. Buddy systems, for example, can break down if the able-bodied team member is injured, trapped in an area of refuge on another level, or otherwise unavailable.
- o A second egress route using outdoor ramps or other barrier-free means of vertical movement can be provided. In some buildings (e.g., one-or two-stories) this will be a simple and effective method of providing redundant egress.

Finally, recent changes in elevator system design suggest that elevators can be useful mechanisms for vertical egress in fires. To use elevators for this purpose safely it is necessary that:

- o the elevator meets ANSI A117.1 requirements for basic accessibility;
- o the waiting area is accessible and safe for both the time needed to place the elevator into an emergency operating mode and the time needed to pick up all those waiting to be moved;
- o the cab and shaft are protected during vertical travel; and
- o the discharge level provides safe, accessible egress from the elevator.

A substantial majority of the Panel believes that these goals can be met by existing technology and that adequate management plans can be devised to implement them. On the following pages appear copies of several attempts to address this issue: 1) a proposed standard for such elevator egress presently being considered by the Committee on Safety of Life of the National Fire Protection Association, 2) a March 1977 bulletin on the subject issued by the General Services Administration, and 3) a 1978 ANSI standard on the subject.

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## PANEL ON EGRESS

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## 5-12\* Special Provisions for the Safety of the Handicapped

5-12.1 Every new building having a passenger elevator shall have every floor below the level of exit discharge and every story served by such elevator, except the level of exit discharge, divided into not less than two (2) compartments by not less than 1-hour fire resistive construction. Every door opening in such construction shall be protected by a minimum of 1-hour fire door having a 450°F maximum temperature rise. Duct openings shall be protected by single blade or curtain type dampers to restrict the passage of smoke and flame into the place of refuge. The smaller of the compartmented areas shall be of size to accommodate 20% of the population of the floor at the rate of 30 sq. ft gross area per person. Each such compartment shall contain a stairway or elevator.

Exception 1: Stories opening directly to grade.

Exception 2: Stories having ramps to grade.

Exception 3: Stories used solely for the service of the building.

Exception 4: Floors or stories used only as parking garages.

Exception 5\*: Elevators may be used in lieu of the area of refuge if they designed to provide reasonably safe egress from the building under fire conditions.

## APPENDIX CH. 5

A-5-12 The provisions in this section are specifically directed to facilitating the evacuation of handicapped individuals who have impaired mobility that prevents their evacuation using emergency egress methods.

A-5-12.1 Ex. 5 Suggested design criteria for Elevator Installations for Evacuation of the Handicapped.

(1) The installation should be designed to provide evacuation of the fire floor first. The number of elevators used should be not more than  $n-1$ , where  $n$ =the total number of elevators in the building. Elevators should be of sufficient number so as to evacuate all persons from the fire floor in less than 4 minutes.

(2) a. Venting of elevator hoistway should not be permitted unless it is part of the smoke control (pressurization) system.

(2) b. A protected area, including the elevator lobby, should be provided at each floor and should be separated from the corridors by 1-hour fire barrier partitions with openings therein protected by 3/4-hour automatic closing doors, (see 6-6.2) which are activated by the detection system described hereinafter. Access to at least 2 separate exitways shall be provided from each protection area. In sprinklered buildings, provisions should be made to keep water out of the elevator hoistway. Elevator lobbies, including hoistways, should be pressurized to maintain a minimum positive 0.03 in. water column with respect to the corridor, with doors to the protected area closed (under fire conditions).

(3) Power Supply. The power supply should be in an approved utility shaft. An approved secondary power supply to the elevators from an independent source in accordance with NFPA 70, Section 700-6b, c, or d should also be provided.

(4)a. Smoke Detection System. At least one smoke detector should be located in each elevator lobby with additional detectors spaced in accordance with NFPA 72E located in each corridor:

1. Upon activation of smoke detector in a corridor location, the following should occur:

- (a) All elevator lobby fire barrier doors on all floors should close.
- (b) Elevator(s) should go into the shuttle mode.
- (c) Fire annunciator panel should indicate fire floor.

Shuttle mode is described as follows: Elevator(s) automatically return to level of exit discharge or transfer floor in accordance with ANSI A17-1. An announcement or sign will indicate that the elevator should be evacuated. The doors will close and the elevator(s) will return automatically to the fire floor. Load passengers and return to level of exit discharge or transfer floor. This cycle to continue until manual return switch at level of exit discharge or transfer floor is activated by the fire services or overridden by lobby smoke detector,

2. Upon activation of a lobby detector, the following should occur:

- (a) All elevator lobby fire barrier doors on all floors should close.
- (b) Mechanical pressurization to shut down.
- (c) The elevator(s) should operated in accordance with the requirements of ANSI A17.1 under fire conditions, overriding the shuttle system.
- (d) Fire annunciator panel should indicate fire floor.

(5) Communications. Internal (Inside Cab) - a means of 2-way communications with the level of exit discharge or transfer floor should be provided (in accordance with the requirements of ANSI A17.1).

Exception 2 to Section 7-4.1

Exception 2: In new buildings, where access for the handicapped is provided in accordance with Section 5-12, designated elevators may be used for exiting to the level of exit discharge or transfer floor. Where this provision is utilized, the elevators shall not be used for computing required exit width.

GENERAL SERVICES ADMINISTRATION  
WASHINGTON, D. C. 20405

March 14, 1977

GSA BULLETIN FPMR D- 145  
PUBLIC BUILDINGS AND SPACE

TO : Heads of Federal agencies

SUBJECT: Facility self-protection plans for using elevators to evacuate the handicapped

1. Purpose. This bulletin notifies Federal agencies of the guidelines established by the General Services Administration (GSA) for the safe use of elevators for evacuating the handicapped during fire emergencies and fire drills.
2. Expiration date. This bulletin contains information of a continuing nature and will remain in effect until canceled.

3. Background.

a. The use or attempted use of elevators during fires has caused many fatalities. In many of these instances, serious injuries and fatalities resulted from minor fires that otherwise would have been insignificant. Experience has shown that the effects of fire and smoke on the operation of automatic elevators is unpredictable. Elevators have stopped on fire floors without signals being activated by occupants. On occasions, elevator doors would not close, preventing movement from the fire floor. Elevators have also unexpectedly stopped at or between floor levels. When the doors would not open, the passengers were trapped in an atmosphere which would not sustain life.

b. Warning signs have been placed in elevator cabs and/or elevator lobbies to educate building occupants to use the exit stairways and not the elevators to egress during a fire emergency.

c. GSA has an ongoing program for the installation of automatic elevator recall systems with emergency service features. High-rise buildings are being given priority in this program. The recall system takes elevators out of service and returns them to a selected floor immediately upon initiation of a fire signal. Elevators can then be operated only by a key from inside the cab.

d. In some buildings the automatic elevators can be recalled manually with a key control in the elevator lobby and then operated manually with the key control in the elevator cab.

e. In other buildings the only way to retrieve an elevator is when the elevator responds to the call button. These elevators also have the key control for manual operation.

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4. Guidelines. The designated official of each Facility Self-Protection Organization should review his present Facility Self-Protection Plan for the evacuation of handicapped occupants during a fire emergency. If the existing plan is not in conformance with the applicable guidelines listed below, the Facility Self-Protection Plan should be revised accordingly.

a. Determine the method for recalling or retrieving the automatic elevators. The GSA buildings manager will be able to provide this information and provide keys for elevator controls. Dependent upon the installed elevator control features, one of the following three methods will apply to any automatic elevator:

- (1) Automatic elevator recall;
- (2) Manual elevator recall; or
- (3) Retrieval and control after elevator responds to call button.

b. Solicit recommendations of the local fire department for evacuating the handicapped. Most municipal fire departments survey buildings, establish predetermined fire attack plans, and have standard operating policies. Fire department response time (the elapsed time between notification and arrival) may influence their recommendations. Professional firefighters are equipped with breathing apparatus and entry tools; and they can use elevators for evacuation, rescue, and firefighting with some degree of safety.

c. In all instances, automatic elevators should be recalled or retrieved during a fire emergency and placed under the control of authorized personnel.

d. Handicapped people who are not capable of negotiating a stairway in a fire emergency should proceed to a point adjacent to the nearest exit stairway and await further instructions.

e. Prior to using an elevator for the evacuation of the handicapped (to an area of refuge within the building or to the outside), a knowledgeable and authorized person should determine that it is safe for this purpose. Normally, the decision regarding the safety of an elevator during a fire emergency should be made by the responding fire department and the elevator manually operated by its personnel.

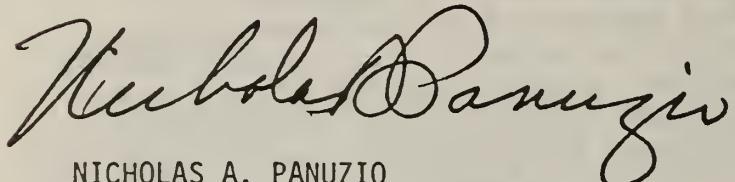
f. In those instances when the fire department recommends evacuation of the handicapped prior to its arrival, or when a unilateral decision is made by the designated official of the Facility Self-Protection Organization to use his members for this purpose, those members should be sufficiently trained and equipped to handle this function. This function should include:

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GSA Bulletin FPMR D-145

- (1) Planned assignment of duties to recall or retrieve and control the use of elevators;
- (2) Qualified members of the Facility Self-Protection Organization who can determine which elevators, if any, are safe to use (The location of the fire is the predominant factor in making this decision. For instance, elevators remote from the fire area may be safe to use);
- (3) A means of communication to alert Facility Self-Protection Organization members which elevators are designated safe to use; and
- (4) A continuous emphasis on training to ensure maintenance of this capability.

5. Notification. Agency heads should ensure that the contents of this bulletin are disseminated to all elements of the agency and the contents implemented in Facility Self-Protection Plans.



NICHOLAS A. PANUZIO  
Commissioner  
Public Buildings Service

\* **Rule 211.3 Operation of Elevators Under Fire or Other Emergency Conditions**

**211.3a Automatic-Operation Elevators.**

All automatic-operation elevators serving three or more landings or having a travel of twenty-five (25) feet or more, shall conform to the following:

- 1 A three position (on, off, and by-pass) key-operated switch shall be provided at the main floor for each single elevator or for each group of elevators. The key shall be removable only in the "on" and "off" positions. When the switch is in the "on" position, all elevators controlled by this switch and which are on automatic service shall return nonstop to the main floor, and the doors shall open and remain open.
  - a An elevator traveling away from the main floor shall reverse at the next available floor without opening its doors.
  - b Elevators equipped with automatic power-operated doors and standing at a floor other than the main floor, with doors open, shall close the doors without delay, and proceed to the main floor.
  - c Door reopening devices for power-operated doors which are sensitive to smoke, heat or flame shall be rendered inoperative.
  - d All car and corridor call buttons shall be rendered inoperative and all call registered lights and direction lanterns shall be extinguished and remain inoperative.
  - e A car stopped at a landing shall have its "Emergency Stop Switch" rendered inoperative as soon as the doors are closed, and it starts toward the main floor. A moving car, traveling to or away from the main floor, shall have its "Emergency Stop Switch" rendered inoperative immediately.
  - f A sensor in each elevator lobby, which when activated prevents cars from stopping at that floor, shall not be substituted for the above requirements.

**2 Sensing Devices.**

In addition to the key-operated switch required in 1 above, heat and smoke or products of combustion sensing devices shall be installed in accordance with NFPA No. 72D in each elevator lobby at each floor, except the main floor. The activation of a sensing device in any elevator lobby shall cause all cars in all groups that serve that lobby to return nonstop to the main floor. The operation shall conform to the requirements of 211.3a-1-a to 211.3a-1-e. The key-operated switch required by 211.3a-1, when moved to the "by-pass" position, shall restore normal service independent of the sensing devices.

**EXCEPTIONS:**

- (1) *Elevators in buildings which are completely protected by an automatic sprinkler system (See NFPA No. 13 Sprinkler Systems).*
- (2) *Freight elevators located in or at openings into manufacturing areas.*
- (3) *Elevator lobbies at unenclosed landings.*

- 3 Elevators without a terminal landing at grade level shall be returned to that landing closest to grade level or other approved level and shall conform to the requirements of 211.3a-1, -2, -3, -4, -5, -6.
- 4 All elevators having a travel of seventy (70) feet or more and elevators having a terminal landing seventy (70) feet or more above

the lowest grade elevation surrounding the building shall be provided with the following operation:

A two position (off and on) key-operated switch shall be provided in or adjacent to an operating panel in each car and it shall be effective only when the main floor key-operated switch (211.3a-1) is in the "on" position or a sensing device has been activated and the car has returned to the main floor or other approved level. The key shall be removable only in the "off" position and when in the "on" position, it shall place the elevator on emergency operation.

The operation of elevators on emergency service shall be as follows:

- a An elevator shall be operable only by a person in the car.
- b Elevators shall not respond to elevator corridor calls.
- c The opening of power-operated doors shall be controlled only by continuous pressure "open" buttons or switches. If the switch or button is released prior to the doors reaching the fully open position, the doors shall automatically reclose. Open doors shall be closed by either the registration of a car call or by pressure on "door close" switch or button.
- d Elevator shall be removed from emergency service by moving the emergency service key-operated switch in the car to the "off" position with the car at the main floor.
- 5 Multi-deck elevators shall conform to the requirements of 211.3a-1, -2, -3, -4, -6, and to additional requirements as follows:
  - a The key-operated switch required by 211.3a-1 may be located at either main lobby.
  - b The key-operated switch in the car required by 211.3a-4 for emergency service operation shall be located in the top deck. The elevators shall be provided with means for placing the lower deck out of service including closing of car and hoistway doors. The lower deck shall be out of service before the emergency service operation from the top deck becomes effective. The means for placing the lower deck out of service shall be located in that deck or adjacent to the entrance in the corridor.
  - 6 The switches required by 211.3a-1 and 211.3a-4 shall be operated by the same key but which is not a part of a building master key system. There shall be a key for the main floor switch and for each elevator in the group and these keys shall be kept on the premises by persons responsible for maintenance and operation of the elevators, in a location readily accessible to authorized persons, but not where they are available to the public.

#### **211.3b Attendant-Operated Elevators.**

Elevators operable only by a designated attendant in the car shall be provided with a signal system consisting of both visual and audible types actuated at the main floor or other approved level, to alert the attendant to return nonstop to the main floor or other approved level. Provisions shall be made to alert the attendant in the same manner when a heat and smoke or products of combustion sensing device is activated.

#### **211.3c Elevators Arranged for Dual Operation.**

Elevators arranged for dual operation shall, when on automatic operation, conform to 211.3a and when on operation by a designated attendant in the car, conform to 211.3b.

NOTE: Where an automatic-operation elevator is on attendant service (independent, hospital, service, inspection, and other similar special operations), it shall be considered as being on operation by a designated attendant in the car.

#### **211.3d Operating Instructions.**

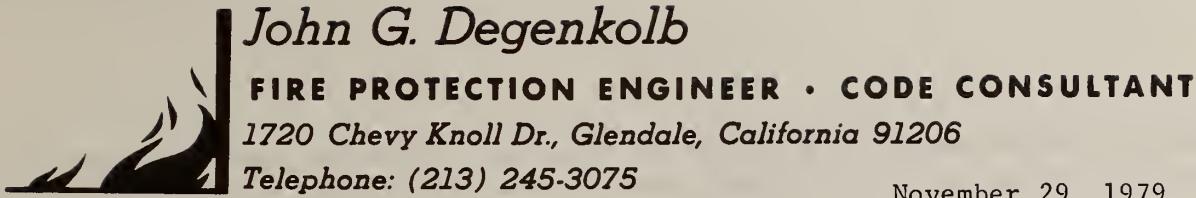
Instructions for operation of elevators under fire and other emergency conditions shall be incorporated within the enclosure for the switch at the main floor required by 211.3a and 211.3b or shall be posted adjacent to it. Instructions shall be in letters not less than one-quarter (1/4) inch in height and shall be permanently installed and protected against removal and defacement.

#### **211.3e Tests and Inspections.**

Elevator operation required by Rule 211.3 shall be checked during inspections and tests required by Rules 1000.1 and 1001.1.

#### **\* Rule 211.4 Floor Numbers**

Elevator hoistways shall have floor numbers, not less than four (4) inches in height, placed on the walls and/or doors of hoistway at intervals where a person in a stalled elevator upon opening the car door, can determine the floor position.



November 29, 1979

Bernard M. Levin  
Room A363 Building 224  
Center for Fire Research  
National Bureau of Standards  
Washington, D.C. 20234

Dear Mr. Levin:

First, I would like to express my appreciation for having had the opportunity to participate in the Conference on Fire Safety for the Handicapped.

My purpose in writing is to try to raise certain considerations which may have not been considered by other panels, particularly where exits are considered.

I would like to start by stating my position. We have gone quite a way in the last few years making buildings accessible to the "handicapped" however the term is used. But none of those "access" provisions have, even remotely, considered how they are to exit the building or even to provide safety for them until they can be removed. I believe we are morally, if not legally, required to make such provisions.

Then, nothing that we do to make a building more accessible should be of such a nature as to endanger or increase the risk for the far greater number of non-handicapped persons who may be present.

Lastly, while it is a nice statement that we should not do anything solely to benefit the handicapped, that isn't possible. On the other hand, if we improve the safety for the handicapped, it is almost certain that safety will be improved for the non-handicapped. As an example, while the upper story of a building may not require a horizontal exit, a place of refuge for the able bodied, the presence of such a facility may well improve their safety as well. So, we may well end up by adding a requirement solely because there may be handicapped present which would not be required otherwise.

These are some of the points which I believe must be considered.

1) where fire doors are required, and that can include doors between a room and a fire-rated corridor; cross-corridor smoke partition doors; stairway doors; entrance doors, etc. a certain closing force is needed to bring the door to the closed and latched position for fire protection purposes. The closing force of a door is about 60% of the opening force. If you accept an 8 pound opening force for an interior door, its closing force will be less than 5 pounds and the door may not close and latch. If that happens we will have lost our fire protection. If it is an exterior door, subject to wind, stack effect, etc. a greater closing force is needed. I believe it is in the range of 15 pounds for an opening force

and that would amount to 9 pounds for closing. These are bare minimums and, even so, we may be on the ragged edge of fire safety with no safety margin.

2) I have a concern over the unlatching mechanism. As soon as the unlatching force is removed, the latch again sets to hold a door in the closed position. Should there be a delay mechanism so that there will be a 2 or 3 second delay before the latch springs back into the keeper?

3) There are numerous power door or power assist doors on the market. Some I would consider unacceptable. For example, an exterior door which is operated by a switch. If the person is in front of the door when it opens under power, the handicapped may be injured. If the switch is exposed and too readily visible, nuisance actions may well cause the property owner to disconnect the power of that door if it opened too frequently during inclement weather. It may pose a security problem and, lastly, the power operator may require back-up power in event of power failure if the door is particularly stiff in action.

On the other hand there are power assist doors which do not open the door but simply make the door much easier to open. I would prefer this.

4) At the present time there does appear to be somewhat of a conflict between those who are working for greater security in buildings and those working for the safety to life from fire. These conflicts must be resolved. Hopefully, the matter of access and egress for the handicapped will be kept in mind and be given proper consideration. And, finally

5) With the realization that many of the handicapped cannot maneuver steps, it is essential, I believe, that every level into which the handicapped are provided access and from which egress cannot be made by a ramp MUST have within that level either a protected area from which a less hurried evacuation can be made or that level must be provided with a fire safe elevator. There is no reason why the elevator lobby cannot serve both of those aims. Before the combination can be accepted, research work on pressurization of elevator lobbies or elevator hoistways must be accomplished. The successful solution of that problem coupled with separation of the lobby from the remainder of the level can produce the safety required for all.

Sincerely,

*John G. Degenkolb*  
John G. Degenkolb

JGD/e

## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held at  
The National Bureau of Standards  
26-29 November 1979

### PANEL ON REFUGE 29 November 1979

This draft report contains the conclusions and recommendations of the Panel on Refuge. Several reports which are being prepared by individual panel members will be submitted within thirty (30) days for inclusion in the final version of this report.

The following instructions were given to the panel to help define the scope of its discussions:

- o The Panel would not define the term "handicapped person".
- o The Panel would not try to write a code or standard.
- o Concepts to be utilized exclusively by the handicapped would not be considered.
- o Concepts developed would be kept simple and uncomplicated, and would apply to "typical" rather than special situations.
- o The potential for retrofit of existing buildings must be considered.
- o Earthquake zones would not be considered in panel discussions.

In addition, the Panel decided that egress stairs cannot be considered as places of refuge for handicapped persons. Stairs must not become blocked as the result of the presence of handicapped persons and their equipment.

#### I. Preamble

As a philosophical approach, the Panel decided that if a level is accessible to the handicapped, a means of exiting, a safe place of refuge, or other means which would provide equivalent safety shall be provided. Likewise, no provisions for the handicapped will be established for the exclusive use of the handicapped.

It has been the intent of this Panel to provide guidelines which will establish an area of refuge which may be safely occupied by the inhabitants of a floor in a building, pending their removal from that building. It is not our intent to inhibit the use of other methods, materials, construction, or devices which would provide equivalent safety.

As a principle, equipment provided to ease door operation by the handicapped to enter areas of refuge or egress shall not compromise the integrity of those protected areas.

It is imperative that confidence in the ability of an area of refuge to protect the occupant from the spread of fire and smoke be established. The panel feels that the issue of developing confidence among potential users should be referred to the Education Panel for resolution.

#### 2. Introduction

The panel first decided to develop two approaches to the question of areas of refuge: one as a staging area for the purpose of holding building occupants until they could exit the building, given a time limit of thirty (30) minutes; the other as an area of refuge, with

more strict requirements, in which occupants could expect to "ride out" the fire for an indefinite period of time.

After developing performance criteria for the two concepts, the committee then decided that only one type of area was needed. It could be utilized to serve the purposes of both to provide evacuation staging or refuge functions as needed. It could be designated as an area of refuge or a staging area.

The panel felt that in keeping with typical code procedures it would develop specific criteria for areas of refuge to be placed in both new and existing buildings.

The panel also has attempted to decide upon the most inherently safe approaches to the provision of safe areas of refuge for building occupants. We feel that the potential effectiveness of areas of refuge increases with the fire resistance of the building.

Parameters were set to define the characteristics of areas of refuge. They are as follows:

- o Fire department capability: impact of local fire service capabilities on fire protection for the handicapped. (See research recommendations, section 3.)
- o Construction type
- o Height and configuration of building
- o Built-in fire protection system (e.g. sprinklers)
- o Occupant load
- o Occupant response capabilities
- o Staging versus holding area concept
- o Hazard of building contents
- o Other generalized ideas

From those and other ideas the following criteria have emerged.

## 2.1 Areas of Refuge

The minimum criteria which the panel has established for areas of refuge are set forth as follows: discussion follows each item in the new construction list of criteria where amplification was deemed helpful.

Additional statements explaining the basis for conclusions reached by this panel will be prepared, if necessary, from analysis of the

conference tapes. Additional reports will be submitted by individual panel members within 30 days.

### 2.2 Panel Recommendations for Areas of Refuge or Staging Areas: New Construction

1. **Fire Emergency Instructions:** Posted on each floor in a conspicuous location. All new buildings must have an approved plan to evacuate the handicapped or to protect them in a place with an acceptable area of refuge.

**Discussion:** This decision was based upon available information on methods in use to make safety procedures available to handicapped persons in accessible buildings. (e.g., State of Massachusetts accessibility regulations).

2. **Fire-Resistive Separation:** Should be the same rating as the floor assembly. A minimum two-hour rating is recommended (1 hour if a sprinklered building). Areas of refuge shall not be permitted in buildings which have fire ratings of less than 1 hour.

**Discussion:** An area of refuge cannot survive beyond the fire survival limits of the supporting floor and structure of the building. A 2-hour rating is recommended for reasons of maximum safety and durability of the space, and the Panel's feeling that the cost increase over 1-hour protection for an area of refuge would generally be reasonable.

3. **Vertical Circulation:** There must be a stair, or fire-safe elevator (which must have standby power) in each area of refuge.

**Discussion:** Some members of the Panel felt that a stair is the most important and reliable vertical circulation element. This area needs further investigation. Additional research is also needed to develop a fire-safe elevator.

4. **Size of Designated Area:** Net area to be determined from formula below:

10% of population to be served @ 15 s.f./person

90% of population to be served @ 6 s.f./person

**Discussion:** Able-bodied persons are served at 6 s.f./person and all handicaps are accommodated at 15 s.f./person. The Panel agreed that proportionally, both large and small buildings should be able to accommodate occupant loads in areas of refuge as established by the formula.

5. **Alarms/Communication:** Alarms shall be required; two-way communication is the minimum requirement. (Special requirements should be provided by other panel groups.)

**Discussion:** As a minimum, an interactive two-way communications system within refuge areas must be provided to insure an accurate awareness of the condition and needs of the occupants. However, this panel feels that the specifications for such equipment are beyond its scope.

6. **Ventilation/Smoke Control:** Duct penetrations through the walls, floors or ceilings of areas of refuge are permitted only when it can be positively established that smoke will not be transmitted either through or around the duct.

## 2.3 Panel Recommendations for Protection of the Handicapped in Existing Buildings.

As a minimum, all existing buildings that are accessible to the handicapped shall have an approved plan to evacuate them or to protect them in place with an acceptable area of refuge. In addition to an emergency plan, apartments and hotels must have at least one division of one hour on all sleeping floors. Such a division should create parts which are about equal. Emergency instructions for each floor shall be posted in a prominent place on that floor in close proximity to the elevator call buttons or ramp access points. In a transient occupancy, fire emergency instructions shall be posted in each room.

Either through an egress pattern or through areas of refuge, everybody must be able to clear an area likely to be exposed to a fire into an area not likely to be exposed to a fire in a reasonable period of time, regardless of handicaps. (The panel feels that a reasonable period of time is somewhere between 1½ minutes and 5 minutes. However, additional research is needed before a specific determination can be made.)

If everybody cannot be moved to a safe environment by use of an egress pattern or areas of refuge as stated in the preceding paragraph, then additional measures must be taken to insure occupant safety. Such measures can include but are not limited to the following:

- \*Subdivision of the building floor (compartmentalization) into separate safe areas by approved methods.
- \*Cross-corridor fire separations (must be attached to appropriate rated floor, ceiling, and wall assemblies).
- \*Provision of individual staging areas near stairs
- \*Provision of fire-safe elevators
- \*Other approved means

## 2.4 Implementation of Requirements for Areas of Refuge

This panel recommends that implementation plans for establishing areas of refuge or staging areas in buildings be developed by all jurisdictions.

For background information on how such a plan might be applied, the panel has become familiar with the plan used in the State of Massachusetts. The state has established an Architectural Barriers Compliance Board. This board is equipped to deal with unusual problems and aids in enforcement of the state regulations. Some details of the implementation policies used in Massachusetts follow and are included for informational purposes.

\*The Compliance Board has legislated authority to enforce handicapped accessibility regulations.

\*Regulations apply automatically to all new construction, and to changed-use buildings; for renovations, additions and alterations, a cost vs. value formula applies as follows:

If cost of construction is equal to at least 5% of building value and parts of building to which regulations apply are affected, those parts must comply.

If cost of construction is equal to 25% or more of building value, entire building must be made to comply.

Construction performed up to 24 months prior to that which triggers latest application of regulations is also counted toward

degree of compliance requirement. No pro-rating of recent work is permitted thus eliminating easy escape from regulatory coverage.

The Board is empowered to grant variances from regulations.

### 3. Recommendations for Additional Research

The Refuge Panel has identified an agenda for additional research. Developments to ameliorate problems encountered with the listed items can be significant in the achievement of effectively fire safe areas of refuge for all building occupants. We recommend that each be investigated. This following list is not ordered by priority.

\*Reasonable time required to clear areas likely to be exposed to fire into areas not likely to be exposed

\*Development of criteria for a fire-safe elevator

\*Education of people to the inherent safety of areas of refuge in order to promote use in fire emergencies

\*Two-way communications systems

\*Smoke damper technology

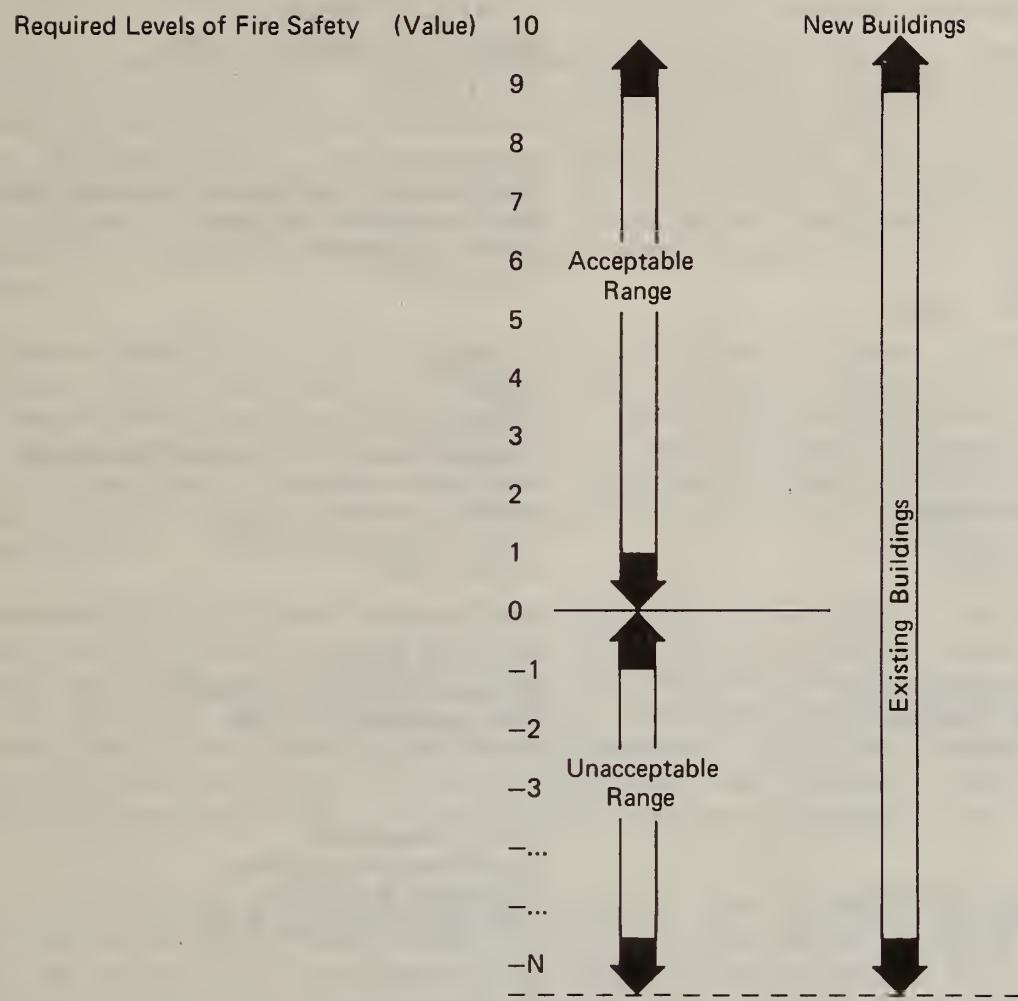
\*Fire Department capability in dealing with hazards should be researched.

A methodology should be developed to measure alternate forms of protection where acceptable fire department capability is not available.

\*A rating system for establishing a desired level of fire safety in existing buildings

- The panel feels strongly that if an existing building is to be accessible to the handicapped, a reasonable overall level of fire safety is essential, areas of refuge notwithstanding. The following chart attempts to illustrate our concept of a rating system. The weighted inputs to make it work will require a major research effort.

**Figure I.**  
**Required Levels of Fire Safety**  
**New and Existing Buildings**



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DRAFT REPORT ITEM

Subject: Area of Refuge

Submitter: Donald W. Belles

Date: Nov. 28, 1979

Time: 2:35 PM

A certain level of risk is inherent in all buildings. The purpose of firesafety criteria is to manage or reduce the level of risk from fire to an acceptable level. It should be recognized it is not possible to achieve an absolute state of safety nor is it generally possible to protect man from his own foolish actions. The purpose of any Code should be to reduce the level of risk to a reasonable level for both the handicapped and the able-bodied person.

The three Model Building Codes of the United States - Uniform Building Code, Standard Building Code and Basic Building Code - have each developed a "package" of requirements applicable to new high-rise buildings. The package of requirements offers two basic fire protection options. The two options in philosophy involve either "compartmentation" or "complete automatic sprinkler protection".

Implementation of the "compartmentation" option will automatically result in the erection of a fire rated barrier each floor creating an area of refuge. Further, a stair and an elevator are required on each side of the barrier. Where automatic sprinkler protection is provided, the "package" of requirements involve provision for exiting, fire alerting and communication facilities, smoke control, electrical supervision of sprinkler system components and features and the like.

Where a building is designed to satisfy the package of requirements found in Model Building Codes for high-rise buildings, a reasonable level of safety is provided for both the able-bodied and the handicapped person. Therefore, where a building is designed to meet the "compartmentation" or "automatic sprinkler protection" high-rise construction criteria of the Model Building Codes no further restrictions are warranted.

COMMENTARY ON REPORT  
OF PANEL ON REFUGE

It would have been helpful if the Panel on Refuge had developed performance goals for the recommended areas of refuge before deciding on "solutions." As it is, the areas of refuge apparently must be available if the building cannot be evacuated in some unknown period of time; it must have 1 hr. fire resistance if sprinklered and 2 hrs. otherwise to allow anyone there to remain in place until the fire is controlled; it must have a stairway or elevator so no one has to remain in place; the elevator must be made specially fire-safe even though it is located in a supposedly fire-safe area of refuge; and smoke-free perfection is demanded of conduit and duct penetrations, but no guidance is given for maintaining a smoke-tight seal on the much larger door openings.

Techniques to maintain a tolerable environment in areas of refuge are not mentioned in either the body of the report or in the research recommendations. The report implies the need for a "tight seal" in separation barriers, but it is not possible to completely seal off a portion of a building unless the area of refuge is constructed with bulkheads and hatches characteristic of a space-craft. Walls are to some degree "porous," whether they have penetrations or not.

Smoke control and movement analyses prove that any normal construction for smoke barriers and self-closing doors is reasonably effective in reducing the spread of smoke into an area of refuge. Increasing the fire resistance is meaningless unless a raging fire is anticipated right adjacent to the barrier. Increasing the "tightness" of the construction provides very little improvement in the total time during which a tolerable environment will be maintained, even if all elements of the construction could be effectively sealed. To concentrate on a  $\frac{1}{4}$  in. or 1 in. piece of conduit penetrating the barrier is senseless.

Either pressurization or ventilation can be used to maintain a tolerable environment in the area of refuge. Both have drawbacks, and research is needed to establish the best means of using these methods in a variety of buildings without introducing additional problems. Pressurization may increase the distribution of fire and smoke throughout the fire area, particularly if it is compartmented, and it is not unreasonable to assume that the wrong zone could be pressurized if the system is automatic.

Ventilation of the area of refuge has been shown to be effective in keeping the environment free of dangerous levels of smoke for long periods of time.\* Normal HVAC systems -- provided the same system does not serve both the fire zone and the area of refuge -- are effective in controlling smoke distribution if they can be conditioned to go into a 100% supply/100% exhaust mode. Even opening windows in the area of refuge often will provide adequate ventilation. Under some conditions smoke from the fire zone could be drawn into the refuge area, and further research is needed to minimize this risk.

BERT M. COHN

\* Campbell, John A., "Modern Applications of the Smoke Lock Principle," presentation at annual meeting of National Fire Protection Association, Washington, D.C., May 1977.

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December 30, 1979

ref: Conference on Fire  
Safety for the  
Handicapped, Nov-  
ember 26 - 29, 1979.

Dr. Bernard Levin  
United States Department  
of Commerce  
National Bureau of Standards  
Washington, D.C. 20234

Dear Dr. Levin:

Below are my comments on the report of the PANEL ON REFUGE.

The criteria set forth for design of safe areas by the Panel on Refuge lacks several very significant items. If we are to encourage the use of refuge or safe areas, we must:

1. Facilitate access by all people:

- a) Accessible entry ports. If the safe area (SA) is to be entered quickly, the entry ports must be easily managed by all. Whatever hardware is used, it must capable of being opened by a person with high level quadriplegia in a wheelchair.
- b) Multipass entry ports. Since not all people can reach the SA at the same time (1 1/2 - 5 minutes) the port must permit multiple pass entry without compromise of the environment in the SA.
- c) Continuous, dynamic directional signals. Visual and audible signals must be employed during the fire emergency to insure that all people can find the SA location in smoke. Strobe lighting, high/low placement of lights, non confusing audible frequencies can and should be used.

2. Facilitate life within the safe area:

- a) Breathable air. More than just a requirement to "keep smoke and toxic gasses out", there is a real necessity to renew or replace the breathable air within the SA. Fortunately, both can be accomplished by pressurization. When the SA is designed adjacent to the elevator shaft, pressurization of both the shaft and the SA can be accomplished together.
- b) Acceptable temperature. The Panel concluded that a two hour fire rating is appropriate for the SA in most cases. I agree. This length of exposure to possible high temperatures however raises a question concerning SA environmental temperature rise if standard, steel fire doors are used. High unexposed surface

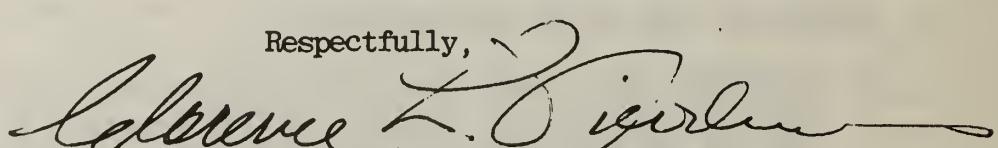
temperatures of these standard doors can subject occupants to unbearable heat conditions as well as to secondary ignition within the SA. Temperatures as high as 500° F have been measured depending on content and proximity of heat source relative to exposed side.

3. Encourage safe area development through building design economies.

- a) The SA cannot be an unutilized island at times other than emergencies. The floor space incorporated within the SA must be available for everyday productive use, not just during emergencies. With current costs/demands for floor space what they are, dead, unproductive floor space cannot be tolerated. The SA must be totally integrated into the general floor use.
- b) The SA design must be consistent with attractive architectural design. The SA cannot be an "eyesore" or burden on an otherwise attractive interior design. It should be consistent with current trends for open space design and flexible space arrangements. This is a challenging design criteria, but without meeting it, a SA becomes an undesirable extra cost.
- c) Non separate or special HVAC consideration. Consistent with b), above, additional HVAC expenses for incorporating the SA in new and retrofit design can be reduced through use of continuous open space-flexible fire barrier concepts. Essentially, using the flexible fire barrier concept, the SA does not exist until emergency does.

Many of these items appear to argue against the reasonable use of safe areas or refuge areas. In the past this may have been the case. Very recently however, the availability on the market of a flexible fire barrier has rendered all of these design constraints manageable. Indeed, it has allowed new creativity in flexible space design with builtin fire safety.

Respectfully,



Clarence L. Nicodemus

Member of the Board, National  
Task Force on Life Safety  
and the Handicapped.

CLN:sgo



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December 21, 1979

Doctor Bernard M. Levin  
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Dear Dr. Levin:

As a member of the panel on Refuge, I offer the following comments on the report developed by majority opinion of the panel members participating:

1. **BASIC CONCEPT** - At the start of the meeting, the chairman set forth several areas that should not be a consideration of the panel. One concept was that earthquakes should not be a consideration of the panel in establishing acceptable areas of refuge. Many areas of the country are located in seismic zones where loss of water can happen in a moderate earthquake. In the event of an earthquake, loss of elevators may result from structural damage or power failure. Additionally, it is possible that damage may occur which would block normal access to escape routes, thus putting a certain sector of handicapped persons in jeopardy. At some point, the decisions made for areas of refuge should be reviewed to see what changes, if any, would be required in seismic areas.
2. **BASIC PREMISE** - The panel decided that if any portion of a building can be reached by elevators, provisions must be made to evacuate the handicapped or provide an area of refuge or ramp exits from the level served by the elevator. It is my opinion that this should not be a mandatory requirement. For example, if a dining establishment has a mezzanine level that can be reached by elevator and the menu is

the same at both levels, it should not be mandatory to provide an area of refuge or ramp exit from the mezzanine. The handicapped should not be prohibited from eating in the mezzanine but should be made aware that in the event of elevator failure no special provisions have been made for those who cannot use the stairs for exit purposes. Similarly, in a hotel where all floors have similar room accommodations, I see no reason to provide safe egress or areas of refuge for the handicapped from all levels. There are many other similar examples which would justify not providing egress for the handicapped. I do feel that if a restaurant or meeting rooms are located on an upper level access and egress for the handicapped should be a consideration.

3. **TRAVEL DISTANCE TO AREAS OF REFUGE** - This was considered by the committee, but it was concluded that spacing should not be a consideration. In an open plan building, spacings of areas of refuge should be a consideration as is travel distance to stairs for an able-bodied person.
4. **EXISTING BUILDINGS** - As noted under "Basic Premise" above, I feel that just because an area can be reached by elevator, it should not be mandatory to provide egress facilities for the handicapped in many instances.
5. **FIRE DEPARTMENT CAPABILITIES** - The panel agreed their report on areas of refuge was based on the fact that an adequate fire department was available. It is essential that a description of what is "an adequate fire department" be established as a guideline to those who may utilize the report. It is further necessary that future research be conducted to establish requirements for areas of refuge where there is no fire department or a very limited fire department.

I appreciate the opportunity to comment and to have participated on the Panel on Refuge.

Yours very truly,

*D. R. Watson*

D. R. Watson, P.E.  
Technical Director

DRW:jg

## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held At  
The National Bureau of Standards  
26-29 November 1979

## PANEL ON SELF-PROTECTION

7 December 1979

### 1. Introduction

The original charge to the panel was as follows: "To concentrate on the psychological and physical aspects of handicapped individuals providing for personal protection and performing specific fire safety duties."

The panel modified the charge as follows: "To concentrate on the educational, psychological and physical needs of handicapped individuals required for personal protection and performing specific fire-related life safety functions in buildings."

The panel listed critical points related to self-protection to be considered in the deliberations:

1. Establishment of emergency action plans;
2. Definition of handicapped individuals consisting of physical, sensory, and mental limitations;
3. The need to prioritize occupancies.  
The panel decided to utilize the occupancy classification developed by the products workshop group and presented in their report.

In order to guide the deliberations, the panel defined self-protection as follows: "To protect oneself from harm in potential or actual fire-related situations."

The panel also defined critical concepts in the definition of self-protection as follows:

Protect - "Involves behavioral actions and the

processes of recognition and awareness with consideration of problems, solutions and limitations of individuals, with consideration of the use of systems and the perception of the need for protection."

Oneself - "The individual and the immediate work or family group, or society."

### 2. Problems

The panel developed a matrix of problems relative to the occupancies identified in the Product Workshop Report. The panel then immediately weighted the problems by occupancies with "1" or "0". Over Tuesday night the panel members were requested to weight problems on a scale of "0" to "3", with "3" indicating the most severe and "0" indicating the least severe problem. Five members accomplished this task. The weighted matrix was presented to the panel, and is presented as figure 1 of this report.

### 3. Solutions

The panel developed solutions to the problems identified in the matrix (see figure 1) as follows:

Problem 1 - Notification (both communication of message and ineffectiveness of message once received).

Solutions 1a.

Requires a multi-modal approach to alerting persons to a fire situation, including auditory, visual, tactual, olfactory and temperature modes.

- b. Notification through persons could include auditory, visual, tactile, and verbal modes.
  - c. Verification procedures - redundant cues are needed to assure response.
  - d. Notification of fire department and emergency medical services using neighbors, telephone devices for the deaf (TTY), telephone, tapes and/or automated devices, preprogrammed telephones, Porta-tels, etc.
  - e. Improved design and maintenance of alarm systems; hardware could include the standardization of notification techniques and maintenance procedures.
  - f. Uniformity of signal related to sensory modes in la.
- assisting in the establishment of emergency action plans for specific buildings.
  - d. Educational materials could be developed and disseminated relative to specific handicapped populations, and to populations or persons involved with specific handicapped populations.
  - e. Educational materials could be developed relative to disabled persons in general for dissemination to the general public.
  - f. Educational materials could be developed and disseminated relative to fire-safety provisions for disabled persons in the various types of occupancies. These materials would be disseminated to designers, managers/supervisors, and occupants.

**Problem 2 - Lack of Knowledge (and) Problem 5 - Training and Education** Note: for the purpose of generating solutions, these problem areas were combined since Training and Education (problem 5) will decrease lack of knowledge (problem 2). See Figure 1.

#### Solution 2 and 5

- a. Research and development - could gather data, and improve present systems.
- b. Model programs - could develop procedures, including the dissemination and evaluation of model programs.
- c. Educational materials should be developed relative to the problem area (2) identified in matrix as lack of knowledge about building, potential hazards, danger of fire, emergency procedures, fire protection systems, fire behavior, and population characteristics, for the occupancies identified in the matrix as residential - single, residential - multiple, commercial, office, industrial, public assembly, institutional and educational. Materials also should be developed for

#### Problem 3 - Limitations of Persons

- Solution 3a.** Could design, develop, market and disseminate information relative to notification systems, buildings, training and self-protection products.
- b. Education and training programs could be developed and disseminated relative to attitudes toward handicapped and attitude of disabled persons. Programs could include information on related laws (such as P.L.94-142 (Education for All Handicapped Children Act) and Section 504 of P.L. 93-112 (Rehabilitation Act of 1973).

#### Problem 4 - Limitations of Buildings

- Solution 4a.** Educational materials developed in solutions (2) and (5) could be disseminated to building design professionals.
- b. Programmatic development of codes could improve buildings and remove limitations.
- c. Different strategies for improvement could be required

- for existing or new buildings.
- d. Improvements could be part of retrofit, renovation, or remodeling projects.
  - e. Egress considerations could be incorporated as an essential aspect of access (possible interpretation relative to Sec.504).
  - f. For existing buildings where retrofit or renovation is unfeasible specific emergency procedures and plans could be developed relative to the variables of knowledge areas for the occupancy as identified in problem and solution (2) and (5).
4. Recommendations & Actions
- 4.1 Short Term - (to July 1981)
- 1. Task Force on Life Safety and the Handicapped should develop or adapt the following educational item: self-survey emphasizing development of emergency procedures.
    - a. Should be concise, based on the information from figures A and B developed by the education workshop. Also, should be oriented to residential occupancies; be targeted to all handicapped populations; emphasize the development of emergency procedures; and incorporate survey and self-survey guides.
  - 2. Task Force on Life Safety and the Handicapped should develop a catalogue of products for self-protection and other fire-related situations.
    - a. Develop and initiate a survey of products within six months (before next meeting sponsored by the Task Force). The survey should refer to fire education materials survey already conducted by U.S. Fire Administration., and include the following:
      - i. Off-shelf items (i.e. presently available)
2. Cost
3. Source
4. Use information
- b. Organize results into a catalogue format to be completed by July 1981 which should be made available to the public.
  - 1. Easily updated (suggest loose-leaf format)
  - 2. Easily used
  - 3. Include recommendations from products workshop
  - 4. Consider using catalogue producers as publishers/distributors (e.g. Sweets, F.W. Dodge Corp.)
  - 5. Possibility of self-support? (Support from manufacturers, advertising)
- c. Disseminate the catalogue to the following :
- 1. Disabled individuals and their organizations
  - 2. Building design professionals
  - 3. Fire protection personnel

3. The Task Force should develop a series of self-protection and fire safety brochures related to specific disabilities (physical, sensory, mental).

Brochures for residential occupancies should be directed to occupants, owners, and managers, and to special living arrangements (e.g. half-way houses, group homes.) Brochures for residential occupancies should be completed first, followed by brochures for other types of occupancies. Brochures should be completed by January 1981. Material in brochures should incorporate suggestions from educational workshop conclusions. Brochures for all occupancies and handicaps should emphasize emergency procedures.

4. The Task Force should develop a program model which effectively conveys fire-life safety information to individual handicapped persons by July 1981. The information should be transmitted by means of the following:
  - a. Fire safety group
  - b. Educational institutions
  - c. Public media
  - d. Educators and student teachers
  - e. Professional associations
5. The Task Force should develop a program model which effectively conveys fire/life safety building design information about handicapped persons to professional groups by July 1981. Information should be transmitted to the following:
  - a. Building design professionals
  - b. Managers
  - c. Government officials
  - d. Building officials
  - e. Fire officials
  - f. City managers association
  - g. Others
3. The Task Force should develop strategies to obtain recognition of building design systems which enhance the self-protection of handicapped individuals in fire-related situations.
  - a. Obtain code approval of the systems for new, renovated or modified buildings (Ref. Sec. 504).
  - b. Building design systems identified in Building Design Workshop should be utilized.
  - c. The Sec. 504 definition of access should include egress considerations.
4. Incorporate and coordinate information about handicapped individuals in fire-related situations with other educational programs and laws, (PL93-112, Rehabilitation Act of 1973, Sec. 504). To accomplish the following: reinforce positive attitudes related to handicapped persons; increase public exposure and increase awareness between all members of our society.
5. Modify existing data gathering systems to obtain data which reflects the experience of handicapped persons in fire related situations. Should include the type of disabilities, and medication where possible.

#### 4.2 Long Term (to be completed after July 1981)

- ! The Task Force should establish consensus performance criteria for product development relative to the following:
  - a. Notification system
  - b. Building systems
  - c. Personal protection devices (see Products Workshop report)
2. The Task Force should develop a plan for the production of products to meet the performance criteria specified in the preceding item. The plan should include marketing strategies.

Table 1  
MATRIX OF PROBLEMS & OCCUPANCIES  
WEIGHTED BY SEVERITY IN OCCUPANCY

	Residence Single	Residence Multiple	Commercial	Office	Industrial	Public Assembly	Institutional	Educational
1. NOTIFICATION (COMMUNICATION OF SIGNAL)	1.8	1.8	2.0	1.8	1.4	1.6	1.4	1.5
a. Ineffectiveness of signal (lack of confidence)	1.4	1.6	1.8	1.6	1.0	1.4	1.0	1.0
2. LACK OF KNOWLEDGE about...								
a. Building	0	0.8	2.0	1.0	1.0	2.4	1.2	1.0
b. Potential Hazards	1.8	2.2	2.0	1.8	1.0	1.8	1.0	1.4
c. Danger of Fire	1.6	1.8	2.6	1.8	1.8	2.0	1.2	0.8
d. Emergency Procedures	1.6	1.8	2.0	1.8	1.0	1.8	0.2	0.2
e. Fire Protection Systems	0.8	1.8	1.6	1.6	1.6	2.0	1.0	1.0
f. Fire Behavior	2.2	2.2	2.4	1.8	1.8	2.0	1.6	1.4
g. Population Characteristics	0	1.0	1.6	1.4	0	1.8	0	0.8
3. LIMITATIONS OF PERSONS								
a. Physical	1.4	1.8	2.6	1.8	1.6	2.6	1.4	1.4
b. Sensory	1.4	1.6	2.2	1.8	1.6	2.4	1.4	1.4
c. Mental	1.4	1.6	2.0	1.8	1.6	2.2	1.4	1.4
d. Attitude towards and of Handicapped Persons	0	1.0	1.8	1.6	0.4	1.6	0.2	1.0
e. Psychological Aspects of Building Use (lack of confidence)	1.6	2.0	2.0	1.6	1.6	2.2	1.4	1.6
4. LIMITATIONS OF BUILDING								
a. Fire Protection Systems	1.2	1.8	2.0	1.8	1.2	1.8	1.0	1.0
b. Access	1.4	2.2	2.0	2.0	1.6	1.8	1.2	1.2
c. Egress	1.6	2.0	2.4	2.2	2.0	2.0	2.0	2.0
d. Areas of Refuge	0	1.4	2.2	1.2	1.4	1.8	1.2	1.2
e. Building System Deficiencies	1.8	2.4	2.2	1.8	1.8	2.0	1.8	1.8
5. TRAINING AND EDUCATION								
a. Lack of Materials	2.2	2.4	2.2	1.8	1.6	2.2	1.8	1.6
b. Limited Programs and Materials	2.2	2.4	2.2	2.0	1.6	2.4	1.6	1.8
6. IDENTIFICATION AND DEVELOPMENT OF PROCEDURES	2.2	2.4	2.4	2.0	1.6	2.4	1.4	1.6

SCALE 0-3

## PANEL ON SELF-PROTECTION

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## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held At  
The National Bureau of Standards  
26-29 November 1979

### PANEL ON MANAGEMENT ACTIONS 7 December 1979

#### I. Introduction

The purpose of the Management Actions Panel was to concentrate on the developmental, educational, and implementation aspects of providing for certain managerial and planning actions that increase the fire safety of handicapped individuals. The concerns of building owners, proprietors, and managers with occupant safety were addressed.

Management's role in providing for and implementing appropriate circumstances which provide for the fire safety of handicapped individuals, as well as that of all other building occupants, is a prime one.

Management must be aware of and concerned with conditions of hazard. It must assume the responsibility to acquire knowledge, develop plans, and implement actions which specifically address the needs of handicapped persons, their strengths and limitations, in matters affecting their safety during times of fire emergency. This responsibility should include but not be limited to 1) building evacuation plans; 2) hazard prevention and fire-safe buildings; 3) public education 4) code management and change; and 5) the establishment of reliable statistical information.

#### 2. Right to Risk

A primary concern of those responsible for the safety of building occupants is the issue of any disabled person's right to risk. There must be some degree of balance between unlimited accessibility with its liability implications and economic impact on building proprietors. The functioning of handicapped persons in all segments of society carries the assumption of risk not only

to the handicapped individual but to other people as well.

While all individuals have the right to go where they wish, handicapped individuals especially need the information necessary to determine their level of risk, in light of their specific handicaps, in different buildings. Living as safely as possible within one's own limitations must apply equally to handicapped and non-handicapped people. The right to risk issue can be seen as a balance between avoidance of unreasonable risk on one hand and total freedom of movement on the other.

#### 3. Problem Areas

The problems addressed by the panel on management actions appear here in order of priority. While it was difficult for the panel to agree on the priority of the various problems and solutions discussed, consideration was given to: the relative costs of potential solutions in terms of time and money; acceptability to various constituencies and the general public; the availability of resources; what we already know about various solutions; and what we need to find out.

##### 3.1. Fire Emergency Planning

It is incumbent on building owners and managers to plan for fire emergency. Federal, state, and local laws must be promulgated or revised so that building owners and managers are provided with the mandate and guidelines to devise appropriate building evacuation plans.

At the federal level, guidelines must be developed as tools for evacuation

planning. In planning for and implementing the use of building evacuation plans, several needs can be identified. General building evacuation guidelines, as designed by an organization such as the Federal Emergency Management Agency (FEMA) must be tailored to the needs of a particular facility. (It was suggested that all buildings over 5,000 sq. ft. need an evacuation plan). This can be accomplished by performing a risk analysis for a building to demonstrate to building designers, owners, and managers the fire safety hazards that must be addressed. Fire safety plans must include information on the following:

1. priority of movement of building occupants
2. specific evacuation routes and alternate routes (horizontal or vertical evacuation)
3. the appointment of floor wardens for building compartments or departments based on size and use, to monitor safety conditions and direct exercises
4. the plan should be developed by the building owner/manager in conjunction with local fire services
5. means of self protection (e.g. areas of refuge)
6. transient building occupant information (e.g. check-in procedures)
7. in-house monitoring of safety hardware and systems
8. graphics for denoting escape routes
9. notification of occupants
10. notification of fire department

A model for such guidelines exists in the requirements for disaster planning of hospitals and nursing homes:

1. prepare general disaster plan for fire, flood, earthquake, etc., including general evacuation plan which must be posted.

Consider:

- fire department notification and response
- means of communicating information about the disaster

- trained assistance personnel
2. perform at least 12 fire drills/year
  3. promulgate "no smoking" control regulations
  4. maintenance, upkeep and testing of fire safety systems
    - smoke detection systems
    - sprinklers and other suppression systems
    - fire alarms
    - smoke evacuation and other mechanical systems
    - fire dampers and fusible links

Implementation of building emergency evacuation plans must be accomplished through performance of regular evacuation exercises. All building occupants, including those who are handicapped, must be included in evacuation exercises in order to promote appropriate fire emergency response. Evacuation exercises familiarize occupants with the path to the area of safe refuge, whether vertical or horizontal. Rescue personnel must occasionally be consulted in re-evaluating the effectiveness of such plans.

Among the strategies which can be identified for accomplishing the objectives of a building evacuation plan are:

1. the requirement of building evacuation plans in order to obtain occupancy permits
2. use of trade and professional associations to develop and promote fire emergency plans (e.g., BOMA, International Association of Fire Chiefs)
3. use of state and local governmental resources to assure planning and exercises (e.g., League of Cities, NACO, Governor's Conference)
4. the encouragement of promulgators of building codes to include requirements for fire emergency plans
5. the encouragement of insurance officials to offer incentives for the provision of building emergency and evacuation plans.

Direct incentives to building owners and managers to take responsibility for fire emergency planning

might include:

1. reduced insurance rates
2. receipt of federal funds for certain occupancies in the form of rent subsidies or other publicly funded programs (e.g., housing grants, revenue sharing, FMHA, etc.)
3. tax deductions for fire safety modifications
4. reduced liability for occupant safety and risk
5. ability to attract certain tenants
6. good public relations and advertisement
7. awards

Appendix A lists several current programs which have attempted to address the problem of emergency planning for handicapped individuals.

### 3.2. Hazard Prevention and Fire-Safe Buildings

For building evacuation plans to be effective, appropriate preventive maintenance, housekeeping and safe practices must be observed. This type of hazard prevention can become a reality at virtually no cost. The development of fire-safe buildings is also important, but will be realized only after considerable time and at significant cost, involving the implementation of design changes in new and existing buildings.

The maintenance, upkeep and testing of safety systems and equipment of existing buildings is a responsibility of building owners and managers. The proper functioning of fire safeguards and systems is imperative to ensure the degree of safety intended by design. Systems that are inoperable simply defeat their fire safety objectives. Hazard prevention also includes control of ignition sources and fuels for fire, as well as hardware maintenance. Some elements of building safety systems which must be verified on an ongoing basis are:

1. good housekeeping - clear corridors, adequate identification and security of hazardous areas, proper storage of materials.
2. maintenance and operation of systems - devices and equipment (e.g., emergency power supplies, door hardware, communications

systems, alarms)

3. currency of building evacuation plans
4. special occupancy aids
5. safe practices (e.g., "No Smoking" regulations, proper chemical handling, open flames, unobstructed exits).

Several strategies were outlined for promoting and facilitating the maintenance, upkeep and testing of fire safety systems of buildings. These include:

1. training of managers and occupants
2. assignment of responsibilities for monitoring safety conditions (e.g., designation of floor wardens for each floor, assigned area, or fire compartment)
3. utilization of various levels of management for inspection programs for furnishings, hazardous areas, etc. (self inspection, inspection by local fire services, by volunteer "watchdog" groups, etc.)
4. routine preventive maintenance
5. documentation of equipment checks, exercises, etc.
6. publicity for safety programs
7. implementation of safety inspections at government levels. (The U.S. Fire Administration should act on their charge of developing a fire safety effectiveness rating system to perform safety inspections.)

Incentives for maintenance of fire safe buildings and testing of safety systems include:

1. recognition from local government and civic associations as well as award programs at higher levels where they carry more weight, such as BOMA, USFA, Governor's Conference, NLC, NFPA, President's Committees, "All American Cities".
2. fire prevention week promotions
3. public attention to safe facilities
4. insurance premium reductions for

total safety systems.

The need to provide fire safe buildings for all building occupants is a primary responsibility of building owners and managers as well as local government. The problem of fire-safe design was addressed for both new and existing buildings.

Several elements contributing to the total fire safety building environment are:

1. layout - including multiple means of egress and areas of refuge, as well as access
2. building and life safety code compliance
3. fire protection devices such as sprinklers and alarms
4. selection of construction materials
5. access for fire fighting (possible use of elevators)
6. contents and furnishings

At the design stage, cost benefits must be evaluated in light of long-term economic and safety considerations. There must be improved communication between building designers, managers, owners and local government from building inception in order for fire safety strategies to be effective in operation.

Fire safety improvements to existing buildings must be made in order to meet the special needs of any handicapped occupants. General upgrading may involve renovation or retrofit of facilities to provide a combination of alarm, detection systems, sprinklers, improved egress, and areas of refuge to provide a level of fire safety appropriate to the use of the building. For example, it is possible to provide, within an environment such as a group home, an area of special protection for a nonambulatory occupant. Likewise, a deaf occupant may be provided certain aids to accommodate his special needs within a facility. The basic philosophy of going beyond minimum requirements should be the impetus to fire safety upgrading in both new and existing buildings.

Among the strategies for improving fire safety in buildings are:

1. use of appropriate review, inspection, and enforcement to ensure safety components when issuing and continuing occupancy permits
2. use of trade and professional associations to develop and promote

alternative strategies for meeting fire safety objectives.

3. use of emergency services personnel as consultants on design and improving buildings
4. balancing costs and benefits not only in terms of dollars but also human factors
5. improved communications between designers, engineers, building owners, and managers who can relate to use and occupancy of buildings. Such communications can lead to the practice of providing for a "building owners manual" which will pass on useful safety information from designers to the users and disseminators of that information
6. use of safety inspections

Among the possible incentives to encourage the builders of fire-safe buildings are:

1. improved safety of occupants
2. reduced insurance premiums for implementation of a total risk-management plan.
3. linking receipt of federal and state funds (rent subsidies, HUD grants, etc.) on periodic review and approval of safety standards
4. tax deductions for fire safety modifications
5. reduced owner liability
6. awards and publicity
7. occupant confidence
8. protection of capital investment

### 3.3. Training and Public Information

The need for more and better means of training all building users in fire safety procedures was identified at many levels. Targets of training and public information programs include everyone from designer and planner to building officials, fire officials, maintenance personnel, and the public. Fire safety awareness curricula must be disseminated through a variety of channels including regional education boards, professional training schools, public schools, and other trade and professional organizations.

Strategies for increasing fire safety education and training include:

1. incorporation of fire safety into courses in design and construction in colleges universities, and technical schools
2. development of training programs in fire prevention that can be utilized at elementary levels and up
3. include handicapped individuals in the group developing educational materials and curricula
4. develop pilot programs for inclusion in architectural and other professional curricula
5. utilize trade and professional journals, organizations and associations (USFA, NCSBCS, University Affiliated Facilities)
6. utilize model code organizations, lobby groups, advocates
7. utilize free sources of information dissemination (e.g., "bill stuffers.")
8. on examinations for licensure and professional certification, include questions on fire safety and the handicapped
9. develop and utilize "canned" audio-visual presentations (NCARB, Engineers, AIP, etc.). including some for use by civic groups
10. civic clubs may provide assistance (e.g., put in curb ramps, smoke detectors)
- II. Speakers Bureaus in local communities should include chiefs, other fire safety experts, handicapped people and advocates
12. use mass media, e.g., public service announcements
13. use trade unions such as firefighters and police in volunteer capacity to promote and sponsor programs on fire safety and the handicapped.

Incentives for promoting fire safety education and training include recognition, awards, and general good will as well as improved professional qualifications. The long term goal of this education program should be improved fire safety for all people, especially those who are

handicapped. Appendix B gives information on some programs to implement fire safety education and training.

### 3.4. Code Management

Building and fire safety codes and standards need to remain current with the state-of-the-art in fire safety. There is a need to encourage administrators to effect code changes to provide for fire safety of the handicapped. In order to advance codes and standards development, a better understanding of flexibility and alternatives in code interpretations may be needed. One solution to the problem of code enforcement is to allow alternative design solutions and trade-offs in fire safety features. Such a system, the HEW/NBS Fire Safety Evaluation System, has been developed and tested for hospitals and nursing homes and may be developed for other types of buildings as well. A better understanding of the code-making process is needed by designers, as well as building owners and managers and government officials.

Several strategies are available for effecting more timely code development and changes. These include:

1. use of advocacy and consumer groups to promote their causes with code promulgators
2. use of research to provide support data to promote code changes
3. awareness campaigns to inform all levels of building officials about code requirements and to create a climate for change (see previous section on Public Information and Training)
4. encourage legislation for code changes
5. encourage "usefulness" and "equivalence" in code interpretation.
6. encourage handicapped persons and advocates to contribute to the codes and standards process (i.e., membership on ANSI committees)

Public pressure, lobbying, and technology advances may help promote code changes.

### 3.5. Fire Information and Statistics

The need for more reliable statistical information and data concerning fire problems underlies all the other problems addressed above. Data which will help to identify the disabilities leading to fire safety problems and which relate

levels of risk in a fire emergency with type of disability may be used to rank and evaluate potential solutions to safety problems.

In-depth investigative reporting systems can be used to acquire this data. Detailed reporting on handicaps, human responses, and building impediments leading to fire casualties should be reported on a National Reporting System such as the National Fire Data Reporting System. Additional legislation may be needed to mandate fire reporting programs and to centralize data.

New research can help to further define the parameters that may affect fire safety for users of buildings, whether handicapped or not.

The main incentive for increasing our data base is credibility and knowledge in coping with the fire safety issue.

#### 4. Schematic Synopsis

Figure 1 illustrates one perspective on the relationship between problem areas in fire safety (operation fields) and management. At the risk of oversimplification, only three operation fields are defined and only six levels of management. It should be clear that not only are other distinctions possible, but, in fact, are needed to classify any particular relationship. It is also extremely important to recognize that the six problem areas delineated in the full report have been reduced to three operation fields.

In this figure, the problems arising in evacuation planning, creating fire-safe buildings, and hazard prevention are translated (roughly) into the operation fields of human conditions and activities, buildings, and contents, respectively. The management problems associated with training and public information, code management and statistics/research cut across these operation fields in complex ways.

A full understanding of particular relationships will require an analysis of these complex problems as discussed in the full report.

#### 5. Future Actions Required

1. Cost analysis for implementing the recommendations (should be done on a state by state basis and item by item where feasible).
2. Implement quickly those items identified to be of relatively low cost, high value and acceptability. (Example: Evacuation planning Guidelines and Evacuation Plans.)

3. Reassess priorities of programs after cost analysis is completed.
4. Study implications of building occupancy and size to fire safety for handicapped persons.
5. Identify and contact special groups that would be instrumental in implementing the recommendations.
6. Establish group of experts (such as FEMA, NFPA, USFA, IAFIC, HEW/RSA, A&TBCB, etc.) to determine which recommendations can be implemented within existing resources and in a relatively short time frame.
7. Recommend amending model building and fire codes to better reflect fire safety provisions, e.g. egress and compartmentalization, which benefit handicapped people.
8. Contact appropriate (USFA, NFDRS, NFPA, etc.) agencies to collect vital statistics on the fire deaths and injuries of handicapped people.
9. The panel did not have adequate opportunity to identify suitable sources of funds available to managers in public and private sectors. It was felt that public funds should be used to assist municipalities in developing emergency plans which include fire safety and the handicapped. The National Institute for Handicapped Research should fund both research and pilot programs in this area. Private grants or donations can be used to assist at a smaller scale of action. Even "in kind" contributions, such as smoke detector installation programs, are significant in this effort.

Fire safety for the handicapped, as well as for non-handicapped persons, must be a national priority. It can, thus, be a focal point and stimulus for voluntary and mandatory action, both publicly and privately initiated.

#### 6. Appendix A

##### Current Plans with Handicapped Provisions and Other Efforts

During the panel discussions several relevant efforts were identified. These include current plans that incorporate provisions for the handicapped and other efforts to address the

needs of different handicapped populations in emergency preparedness planning. These are:

- o Georgia Disaster Plan: Appendix
- o Missouri State Plan: The section of the state plan on Nuclear Civil Planning (NCP) requests that local governments identify handicapped individuals in their jurisdictions and identify their transportation problems related to evacuation.
- o University of Omaha, Community Action Social Services (CASS) has done some work in this area.
- o National Council on the Aging (NCOA): NCOA held a planning meeting on the elderly and emergencies about a year ago.
- o Buffalo, New York, has a disaster plan for the elderly and the handicapped which is primarily a snow disaster plan.
- o Minneapolis, Minnesota: A developmental disabilities group (contact: Doris Harr) has done some work in the area of the developmentally disabled and emergencies.
- o Lincoln, Nebraska: The Lincoln Disaster Plan has provisions for the mentally retarded.
- o National Institute of Mental Health: There is research being conducted under Disaster Act funds on mental health aggravated by disasters (including effects on people of psycho-pharmaceuticals). The contact person is Dr. Frederickson, Disaster Branch, NIMH.
- o Almost every Federal agency has a limited disaster branch. Efforts should be made to identify what each of these isolated branches is doing.

From: Fire Control Digest, Oct. 1979  
(Appendix A cont'd)

#### IAFC TO SURVEY EMERGENCY PREPAREDNESS

The International Association of Fire Chiefs has been awarded a contract by the U.S. Defense Civil Preparedness Agency to identify the extent of involvement, cooperation and success between fire chiefs and emergency preparedness directors in the development and operation of disaster contingency plans.

The DCPA contract to the IAFC follows President Carter's recent reorganization plan establishing the new Federal Emergency Management Agency (FEMA) which will consolidate federal programs involved with preparedness, mitigation and responses to natural and man-made disasters.

Although FEMA will respond to national disasters, the foundation for an effective and efficient response will be made by the first responders, the local fire departments and the emergency preparedness agencies.

In any emergency or disaster incident affecting life or property, the local fire department will provide the first response and assistance. When the disaster incident is beyond the capabilities of the local fire department or requires the assistance and resources of other agencies, the local emergency preparedness agency will become involved. It is necessary, therefore, that these functions of local government operate in a spirit of cooperation.

The development of disaster contingency plans by emergency preparedness agencies must have input from the local fire department. In order to develop effective contingency plans, the agencies involved must have an understanding of the capabilities and preconceived ideas must be identified and corrected. In effect, the fire department must know what can be expected from emergency preparedness agencies and contingency planners must know and understand the capabilities of the fire department.

According to the International Fire Chief Magazine, the IAFC project team will accomplish the five following tasks: 1) a survey of the IAFC members to identify fire chief participation in emergency preparedness contingency planning; 2) a literature search to identify effective contingency planning models; 3) development of emergency preparedness planning guidelines relative to fire service operations; 4) preparation of a final report; and 5) publication of an executive summary in the International Association of Fire Chiefs magazine, The International Fire Chief, and the United States Civil Defense Council Bulletin.

Editor's Note: Individuals interested in sharing their disaster planning problems, solutions or resource materials are urged to contact: Michael S. Hildebrand, International Association of Fire Chiefs, 1329 18th Street, N.W., Washington, D.C. 20036. Phone: 202-833-3420

## 7. Appendix B

### From Fire Control Digest, Oct. 1979 Pre-Schoolers' Learning Aid Teaches Matches Danger

Children at the impressionable ages of three and four years can learn about match safety from a new slide program prepared by the International Fire Service Training Association.

"Matches Aren't for Children" is a series of 16 slides with a narrative on cassette tape and includes tips on making the presentation. The slide program uses cartoon characters to keep the young children's attention.

To order the package, contact IFSTA Headquarters, Fire Protection Publications, Oklahoma State University, Stillwater, Oklahoma 74074. Phone: 405-624-5723. Or, contact your local IFSTA representative. The package costs \$20.

### From Fire Control Digest, Oct. 1979 "How-To" Available On Public Fire Education

A new manual that addresses the problems and solutions of public apathy and ignorance towards fire is now available from the International Fire Service Training Association.

Entitled Public Fire Education, the manual was developed to provide firefighters with basic knowledge concerning the problem of reaching the public with educational programs.

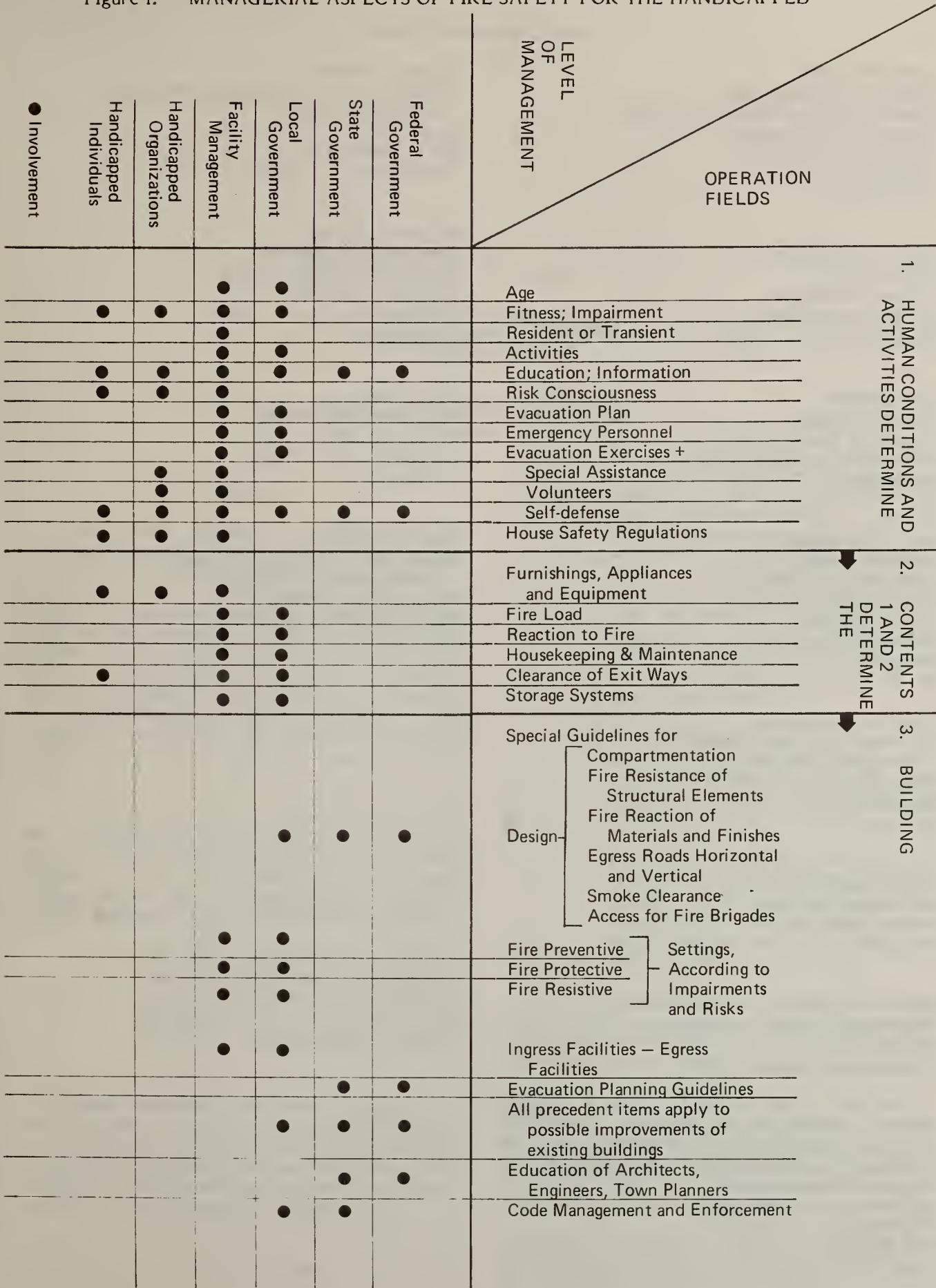
Contributors to the text include experts in the fields of public fire education media coordination and first aid. Fully illustrated, the 170-page manual takes a comprehensive look at the importance of planning and implementing community-wide fire education programs. Specific age groups are the subjects of varied approaches to the problem. The book also includes program evaluation methods.

Other topics addressed include seasonal programs, programming for smoke detectors, visual aides, and resource sharing.

Editor's Note: IFSTA 606, Public Fire Education, is available at the cost of \$7.00, from Fire Protection Publications, Oklahoma State University, Stillwater, OK 74074. Phone: 405-624-5723.

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Figure 1. MANAGERIAL ASPECTS OF FIRE SAFETY FOR THE HANDICAPPED



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## FIRE SAFETY FOR THE HANDICAPPED

A Conference Held at  
The National Bureau of Standards  
26-29 November 1979

## PANEL ON EMERGENCY SERVICES 17 December 1979

### I. Introduction

This report presents the results of the Emergency Services Panel, part of a Symposium on Fire Safety and the Handicapped, held on 26-29 November 1979 in Washington, D.C. The Emergency Services Panel was one of 6 such panels at the conference, whose purpose it was to develop a basic document, and to provide future direction in the field of fire safety for handicapped individuals. Panel discussions focused on the development of fire-safe environments and emergency procedures in buildings for those people with physical, sensory or mental disabilities.

Participants in this panel felt that its role was to identify emergency services' roles, considering how these were related to topics being discussed in the other panels. The panelists adhered to this for the most part, with 3 major ideas emerging as basic to the 2-days' discussion:

- 1) the rights of disabled\* (physically or mentally) individuals to the same fire protection as the able-bodied population. The point was made that while disabled people should not

receive preferential treatment in a fire situation where everyone requires rescue, they should certainly not receive less attention and protection. They must have the same opportunities that able-bodied people have to notify the fire department, etc.; this is where a great deal of work is required, in making those opportunities equal to those of the able-bodied population.

- 2) the importance of pre-planning on the part of emergency forces cannot be overemphasized, particularly with respect to life safety and the disabled.
- 3) all of the recommendations of this panel must begin with the statement of our assumption that buildings are designed properly in terms of fire safety, though such is obviously not the case now.

At the beginning of the meeting, there was some discussion about providing definitions of terms used by the panel throughout the meeting. A list of those most frequently used follows:

disabled: a disabled person may or may not be handicapped, depending on a variety of factors which are present in a fire emergency. To some, the use of the word "handicapped" is distasteful, demeaning, and inaccurate, while the term "disabled" is far more descriptive.

emergency services: emergency services are those services which are performed to terminate any immediate threat to life and property. In this panel, this was interpreted with regard to fire

\* The panel preferred the term "disabled" to "handicapped". A disability may or may not result in a handicap, depending on a variety of factors, including environmental factors, found in a fire emergency. The term "handicapped" is considered by some to be demeaning and inaccurate.

threats, and the Fire Department was used consistently as representative of emergency services.

assist, evacuate, rescue: these are three terms customarily used by the Fire Department to distinguish among different types of activity required to handle a fire emergency. "Assist" implies building occupant cooperation among themselves; "evacuate" requires the cooperation of the building occupants with the Fire Department; and "rescue" means that the Fire Department is in control of the situation, and the occupants are completely unable to help themselves.

stationary disability: this term was used to describe those people who are incapable of independent movement, or self-exiting, during a fire, and therefore require special assistance from the Fire Department.

Throughout the course of the meeting, panelists were not restricted to discussion of a single building type. It was agreed that responses of emergency services are scaled not only to the magnitude of the emergency itself, but to the building's structure and occupancy type as well.

The discussion was structured according to the following topics: identification; pre-planning; responsibility; communications; education; and recommendations. This report presents the meeting results in that order.

## 2. Identification

The first topic to come under discussion was the identification of disabled individuals and their locations in a community. Initially, there was some strong disagreement among panel members. Those who opposed identifying where disabled individuals live did so for the following reasons:

- o The fire department is obliged to rescue everyone on an equal basis. Disabled persons should not be identified because manpower necessary to fight the fire will be diverted first to the identified person, and maybe not to the area of greatest need.
- o Numerous security problems can arise from marking the home of a disabled person; thieves have, in the past, found such homes easy targets.
- o Many disabled people are now being absorbed into the so-called "mainstream" of life. There is a greater and greater variety of activities in which they are participating. Such identification could be construed as an invasion of privacy, a

trespassing on the feeling that disabled individuals do not wish to be singled out from the majority of the population.

- o It is doubtful that the mandatory registration of disabled individuals with the fire department would result in increased effectiveness of rescue.
- o How does the service which the fire department provides for the disabled differ from ordinary work with people of all ages, sizes, states of mind, etc.?

Those participants who favored the identification of disabled individuals supported their position with the following statements:

- o The fire department needs to have this information in order to complete successful pre-planning efforts. These would include the distribution of manpower and decisions on methods of evacuation and equipment to be used.
- o Fire situations are usually considered to be full of surprises; the job of the fire department is made easier if the number of surprises is minimized.
- o If disabled individuals are included with the community, it is respectful of their rights as members of the community to identify them in the pre-planning process. Therefore, a disabled person has a responsibility to let the fire department know if they will need special care at the time of the emergency, and immediately afterwards. The fire department also has a responsibility to let the disabled know what they can do to help themselves.

At one end of the spectrum, then, is the desire of disabled individuals for anonymity; at the other is the fire department's desire for information on locations of those requiring special attention for long periods of time.

Up to this point, all fire department identification systems have been voluntary, and only certain departments have them. For example, the Huntington Beach, California Fire Department seeks out information on locations of disabled individuals when doing their pre-planning, although people do not have to be included if they do not wish to be.

It was recommended by the panel that fire departments should compile these data on stationary disabilities, build them into their pre-planning programs, and maintain the security of those files. It was also recommended that some kind of locating device ("beeper") be developed for use on the person or his wheelchair, to avoid

the problems created by "on-the-scene absence" of the identified person.

### 3. Pre-Planning

Pre-planning for fire emergencies, as one of the panel's major topic areas, seemed to recur as an underlying theme in most of the other topical discussions. Its importance in dealing with fires in a general sense cannot be underestimated, but its importance in fire safety for the disabled is crucial. It is estimated that less than 5% of the buildings in this country have been pre-planned by local fire departments, but the figures are on the rise.

First of all, pre-planning helps to remove the element of surprise in combating a burning building. What is important to remember is that in many fire situations there can be a fatal flaw, even if that particular building is well-designed. Frequently the flaws are aggravated by the incompatibility of the firefighting force with the building. These incompatibilities can be minimized through pre-planning.

Pre-planning requires the cooperation and involvement of both the building manager and its occupants. The pre-plan must include information on what the fire department can expect, what actions occupants should take, and what role building management must play. The department is then able, in the event of an emergency, to make decisions regarding adequate manpower, the level of service required, how to manage the rescue operations on the scene, and the type of response necessary. In cases where there are no pre-plans and the department is unfamiliar with the building, evacuation must occur. Most codes currently in existence are predicated on evacuation, although some new buildings are built with areas of refuge.

Recommendations from the panel in the area of pre-planning include the following:

1. Building plans can be produced which include all the information necessary to the fire department. These can then be reduced or computerized for use in the engine companies and at the alarm centers.
2. Data identifying the locations of stationary disabled individuals can be compiled and filed in a rolodex for use in the engine companies (see section on Identification).
3. Pre-planning should involve building management and the building occupants to a much greater extent.

4. Building inspections by the fire department should occur more frequently.
5. Fire departments should make use of the National Fire Reporting System, a databank which is in development, with information on buildings and their occupants, and categories of fire intervention worked out.
6. For building types housing transient occupants (hotels, etc.), a small system should be developed which could record the locations of disabled individuals in the building, and which could be kept at the front desk.
7. Pre-plans should always be rehearsed by the occupants with the fire department.

### 4. Responsibility

Aside from the ever-growing consideration of liabilities and lawsuits, there is a great need to clarify the nature of fire department responsibility and fix the decision points needed for a sound approach to the problem.

Classically, if simplistically, the fire department is supposed to keep the city from burning down; nowadays, one tries to confine the fire to a narrower area, but the programs and decisions remain very much the same. Operationally, other occupants "assist" the disabled; fire department personnel lead an "evacuation"; and only fire department personnel perform "rescues" in places others cannot go, i.e., just outside the flame area. Thus, the fire itself "decides" who gets what attention by forcing that decision on the fire officer in charge; after the alarm is sounded, nobody receives preferential treatment by virtue of physical or mental condition, but only by virtue of their fire location.

Thus the question of moral responsibility is overtaken by events, and the skills of the rescuer determine who is actually saved, particularly when complex tasks such as unhooking people from life-support machines are involved. There is probably a moral obligation to be sure that the disabled individuals who are evacuated are not left to fend for themselves, since their potential for coping when abandoned on the sidewalk can be notably less than that of able-bodied people in the same situation. In Newark, New Jersey, the fire department's community relations bureau provides this support for all fire victims, but many other communities have no such pre-plans.

Moral responsibility toward the disabled has one real and trying aspect: by failing to provide them with the opportunity to do things to save themselves, we may in fact be giving them less and not "equal" service. Equal service is the overall intent, and indeed the legal requirement.

Other legal responsibilities of the fire department vary with local ordinances and with fire department makeup. For example, some large cities such as Kansas City, Missouri, do not include medical or ambulance service. Thus fire departments may or may not interact with building management, hospitals, or other segments. However, at the fire scene the fire officer is everywhere unquestionably in charge. (Some hazardous materials events involve federal and state forces, and some jurisdictional questions can surface as a result.)

Fire departments are daily confronted with a population mix that includes the permanently disabled as well as the temporarily disabled, (such as drunk, drugged, in casts, infants, smoke inhalation of victim, etc.). Yet the expectancy of such problems varies from occupancy to occupancy; one expects to move disabled people during a hospital fire, but how can one be specific as to expectations at a department store? Pre-plans can pay off only insofar as forecasts are accurate and training is designed to match the needs. A good example of awareness is Seattle, Washington, where engine companies inspect "night hotels" every evening. On the other side is the possibly disastrous evacuation of a hospital on the decision of an administrator who does not wait to consult the fire department.

Many factors are rooted in sound building design. Where good design and good plans exist, chances for survival are greatly enhanced. Retrofitting old buildings remains a touchy subject, yet fire departments can and must insist on involvement in all plan approval processes, for new or old construction. Local evacuation plans are worthy of study especially where successful operations have been carried out. Recent examples are the hurricane evacuations of Miami Beach, Florida, with tens of thousands of elderly, and Mississauga, Ontario, where over 200,000 people were moved to avoid a railway incident. An NFPA report on the latter is expected soon; it should show percentages of disabled persons involved.

## 5. Communication

This section is oriented principally toward hardware and systems, rather than voice contact or interpersonal matters. The intent is not to downplay the frequent need for one-to-one visual or voice contact, but to cover technological

approaches of possible utility to emergency services.

No concepts were advanced that appeared beyond the scope or capabilities of current technology. Emphasis must be on early notification, for the time between receipt of alarm and arrival by the fire department at the scene is not readily shortened. Mechanical means not dependent on human intervention seem best, but suffer from false alarm problems. A slightly less reliable but more credible system involves a single human act: pushing a button that sends a coded alarm. In either case, a manual backup or verification capability is needed. (See earlier section on "Identification" for a discussion of voluntary participation by the disabled in fire department notification programs). Special techniques are available for the deaf or those with speech impediments; an example is the Las Vegas Fire Department's automatically dialed, taped message. Closed-circuit TV is useful for non-fire and non-burglar reporting, as for invalids. The coaxial cable system connected with Cable TV in Woodlands, Texas and the smoke alarms in Homewood, Florida are examples of programs developed by the U.S. Fire Administration under its Automatic Residential Alarm System (ARAS) program. While relatively expensive, these systems apply current technology and often piggyback onto other systems (such as Cable TV).

On another level, the disabled must be able to ask for specific help. This might be from a remote location or in direct personal contact. For example, many leg-injury-only wheelchair people can move faster than the able-bodied, but many need help getting into their chairs and they may need help in communicating that need.

Finally, there arise situations in which the disabled must be sought out, perhaps in a noisy or smoky environment. For this purpose a number of beepers are available, and development of a small two-way transponder is feasible. Such a device in wristwatch size could be forecast to cost less than \$200, and would require a larger interrogator device, perhaps as a fire department backpack unit.

When emergency forces have been dispatched, current practice frequently calls for transmission of details as to mission location and other circumstances by voice radio to the officer in charge, or a first-fire-area reference file may be in the vehicle. No new technology is needed to allow the update of this data, which in itself reduces the need for transmission of specifics when the alarm is tuned in. One notes, however, that overuse of electronic devices is to be avoided for both operational and fiscal considerations.

Despite all advances in hardware, there will always remain a certain need to talk to people in

person or on the phone. Even the able-bodied can encounter difficulties here because of language barriers. Some fire departments have cards at control centers and on the apparatus with key words in languages prevalent in their operating area, as well as sign language cards. If a fire department contemplates starting such a program, good data on language incidence can be obtained from the public school system.

The items discussed above range in cost from nothing (except for time expended) to facilitate interagency cooperation and information flow, to perhaps billions of dollars for personal hardware. Federal funds are likely to be devoted to development efforts, but deployment funding would likely be limited to prototypes and validations. Some increase in training costs can be anticipated if fire departments are to upgrade their ability to deal with situations involving the disabled, but the increased quality of performance would offset this readily.

For expensive systems, such as automated alarms, computer-assisted dispatch, or locational transponders, a regional approach can reduce costs to a given entity. Use of the system by all emergency service components (fire, police, rescue, etc.) also produces cost savings. Adaptation of existing systems costs least of all, and has the added advantage of being feasible now. Preparation and use of language books need not await program decisions or huge appropriations. There exists a wealth of specific upgrading programs that any fire department can start now at minimum costs; only initiative or motivation may be lacking.

## 6. Education and Training

Three groups of individuals require education and training for dealing with the disabled in fire emergencies: building managers, firefighters, and the disabled persons themselves. The absence, or shallowness, of education and training of any one of these groups can create problems which increase the risks to the disabled under fire conditions.

Building managers must recognize that disabled people may suffer greater risk in fire situations, and must be able to assist the responding emergency forces on the scene by supplying a list of disabled persons in the building, their locations, and, if at all possible, their disabilities. Various disabilities, their combinations, and degrees of disability present a continuum from little or no risk to that which is considerably above average, and from little or no required assistance to total help. This information is crucial for the fire officer in charge of the responding force to make the

necessary decisions to effect a successful operation.

Building managers must also be educated to realize that the responding emergency force will operate in the most efficient manner if there has been effective pre-planning with good personal communication between the fire department and the building management. Managers must also be aware of their responsibility, moral or otherwise, to provide services to safeguard and assist the disabled occupying and exiting the building, once the building has been made accessible to them.

Logically, the fire service is the instrument by which building management personnel should be educated in these areas, since the fire service will be the first to respond in case of a fire. If a fire department has undertaken such an educational campaign, they will be familiar with the building, its built-in protection, the emergency plan in effect, and the management personnel with whom they will be working at the incident. Proper building maintenance is also important; no matter how well-designed a building may be, it becomes useless if not maintained properly. These types of information are crucial to the fire officer's appraisal of the situation, and subsequent decisions.

Fire service personnel must be trained in pre-fire planning activities, and educated in the usefulness of such plans in carrying out efficient operations. Built-in fire protection features must be thoroughly understood and pinpointed in the building if they are to be used efficiently. There must also be extensive training in recognition and handling techniques for the disabled. Training should also be required in post-evacuation care.

Both disabled and fire department people are not ordinarily aware of the possible risks involved in buildings, and possible actions that will be taken to help them. Also, most rehabilitation programs are not linked to where one lives or works. If possible, a basic program should be developed for all disabled, regardless of the type of building in which they live or work, setting out the risks involved and self-help actions that can be taken to mitigate risks and get assistance.

The decision on the selection by a disabled person of an apartment should take into consideration the risk involved as a result of such selection. The decision should be made on the view afforded, price, parking, neighborhood, safety, and other considerations such as egress paths. In too many cases, the potential risk is not considered, even if known. With proper education, disabled people will be in better positions to make decisions which will enhance

their safety prospects and ability to help themselves and assist those who must aid them. Educational efforts for the disabled should be shared, involving the fire department and rehabilitation or social service groups. The fire department should undertake the training of rehabilitation personnel, so they in turn can educate the disabled in the realities of the risks they face, and actions that can be taken in a fire emergency.

All three groups, building managers, disabled persons and fire service personnel, must be aware of the total situation the disabled face when they enter any building. The safety of the disabled, and those around them, will be dependent to a large extent on the level of this understanding, and the actions that each group takes in a fire situation as a result of it.

## 7. Recommendations

What follows here is a list of recommendations which were made during the course of the discussion. We have grouped them together for reasons of simplification. They are as follows:

1. It is hoped that this emphasis on disabled needs will shed light on the existing inadequacies in building construction and provide the mechanisms for correction and retrofit for reasonable harmony with the state-of-the-art of fire protection to benefit all persons.
2. Fire department personnel must demand involvement in the design of new buildings and the retrofit of old ones.
3. Where a retrofit program for a building is considered expensive, alternative methods must be developed to address the problem. These methods should then be ranked in importance, to encourage building owners to do what is necessary for fire safety.
4. Pre-fire planning should be undertaken by the fire service at all buildings requiring such plans. It is probably the most important and effective way to deal with the disabled in fire situations. Pre-plans should be rehearsed in exercises involving all segments of the system.
5. Fire departments should consider making greater use of the police powers granted them in closing down buildings where there is a severe life hazard, even though the building at one time was built in compliance with existing codes.
6. Fire departments should do things immediately which are not costly to enable the disabled to seek help. The community must be made aware that service for the disabled is available.
7. Building managers, the disabled, and fire service personnel must be educated to recognize the risks the disabled are exposed to, and means of assisting the disabled in the fire situation.
8. Fire departments should compile data on the disabled, and build such data into their pre-fire plans. The fire department must maintain security of such data, so that they do not get into unauthorized hands.
9. Identification of disabled people for fire department purposes should be voluntary, preferably after an educational campaign.
10. Fire departments must be educated to realize that the disabled person can be found anywhere in the environment, and educated to handle the situation efficiently.
11. Technology currently available must be placed into more widespread use, particularly where the disabled are involved, to reduce the time between the inception of the fire and transmission to the fire department.
12. Fire department personnel should be educated to bridge communication barriers in carrying out rescue operations.
13. A study manual should be developed for fire services personnel and the disabled outlining the methods that can be used to assist and safeguard the disabled in the built environment.
14. The recommendations for fire departments and their interaction with the disabled should be tested under real-world conditions through the use of demonstration grants.

## 8. References

During the course of the meeting, several documents were cited which were useful. The list follows:

1. Code for Safety to Life from Fire in Buildings and Structures, NFPA 101-1976, Ch. 17, "Operating Features." Boston: National Fire Protection Association, 1976.
2. J. V. Fechter and E. M. Robertson, Catalog of Security Equipment, National Bureau of Standards SP 480-35. November 1978.
3. Health Care Emergency Preparedness. NFPA Manual 3M. Boston, National Fire Protection Association, 1975.
4. International Conference on Firesafety in High-Rise Buildings, April 12-16, Airlie House, Warrenton, Va. Sponsored by the Public Buildings Service, The General Services Administration. May 1971. GPO No. 2204-0005.
5. NFPA 101, 1980 edition, will include a section on disabled persons in fire emergencies.
6. ARAS Report. U.S. Fire Administration. In preparation.

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December 30, 1979

ref: Conference on Fire  
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Handicapped, Nov-  
ember 26 - 29. 1979.

Dr. Bernard Levin  
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Washington, D.C. 20234

Dear Dr. Levin:

Below are my comments on the report of the PANEL ON EMERGENCY SERVICE ACTIONS.

I find the report generally excellent. New ideas and directions for efforts in my professional area of Rehabilitation Engineering are suggested and appreciated. I have to take one exception, however.

The idea that the disabled person must be "rescued" pervades this entire draft. This is an understandable attitude given the current situation with our inadequate and conflicting building codes, inadequate buildings and alarm systems, etc. However, efforts must be consciously redoubled to improve the building environment so that "rescue" is not necessarily required but is the exception. All people, including disabled people must be provided suitable means of independent or self actualized escape or protection through planning, building design and code development. "Rescue" would then occur only when these efforts breakdown, are ill conceived or insufficient to match the emergency.

I guess what I am trying to say is this:

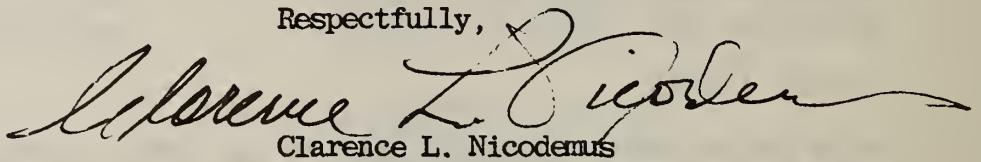
1. A person who is disabled can do a great deal to help him/herself in an emergency, if the means is available.
2. It appears to be an inefficient use of emergency service manpower to plan to "rescue" all the disabled people in a given situation, especially when they can, in most cases, help themselves.
3. Focus the "rescue" efforts on those who are totally incapacitated through injury or other trauma during the emergency. Those who are slightly injured will be much more able to help themselves through building design consideration that provided for the so called "handicapped" people.

In other words, when the building fire emergency needs of this supposed "small group of disabled people" are met, the needs of many others of us "ablebodied" people will also be met. This includes the rescuer who becomes disoriented in the smoke environment, but locates an exit

because of the strobing lights placed there to aid visually and hearing impaired persons.

It appears to me that the people involved in this Panel were predominately realists, as reflected in the draft, and rightly so. I urge the thought of improvement of things beyond the mere hope of just a successful "rescue" however.

Respectfully,



A handwritten signature in cursive ink, appearing to read "Clarence L. Nicodemus".

Clarence L. Nicodemus

Member of the Board, National  
Task Force on Life Safety  
and the Handicapped.

CLN:sgo

## WORKSHOP I: CODES AND STANDARDS

Reported by Sharon L. Machida

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### I. Introduction

This paper presents the results of the Codes and Standards Workshop on Life Safety and the Handicapped held on 13-14 August 1979 in Washington, D.C. This was one of six workshops convened by the AIA Research Corporation and the Task Force on Life Safety and the Handicapped for the purpose of developing work documents for a November 1979 Symposium on Life Safety and the HandicapPed. The workshop participants are listed on page .

At this workshop, participants concentrated on the adequacies, inadequacies, and the potential of codes and standards to ensure the life safety, particularly the fire safety, of handicapped individuals. The general questions which were addressed in the workshop were:

- I. What codes and standards have an impact on life safety for the handicapped?
- II. What are the tenets of a philosophy which could form the basis of codes and standards that would be adequately responsive to the life safety needs of the handicapped?
- III. What problem areas can codes and standards reasonably be expected to deal with? What problem areas do they already address? To what extent?
- IV. What directions should efforts to alter codes and standards take if they are to become more responsive to issues related to life safety and the handicapped?

The following discussion presents the responses of the workshop participants to these questions.

### 2. Relevant Codes and Standards

Several codes and standards have an impact on the handicapped in life-threatening situations. A few of them currently contain specific provisions on life safety for the handicapped; some of them are being revised to incorporate provisions for handicapped. These relevant codes and standards are:

- o The Four Model Building Codes: the Standard Building Code of the Southern Building Code Congress (SBCC) 1979; the Uniform Building Code of the International Conference of Building Officials (ICBO) 1979; the BOCA Basic Building Code (Building Officials and Code Administrators) 1978; and the National Building Code, AIA 1976. These codes include sections on accessibility provisions, but no life safety provisions which are directed at the handicapped.

These include Fire Alarm Standards (Vol. 7) and the Fire Prevention Code (Vol. 12).

- o NFPA 101 Life Safety Code: the current NFPA 101 does not specifically mention the handicapped in its provisions, but the 1980 edition will have specific provisions for the handicapped.
- o The California, Illinois, and North Carolina State Building Codes: these three codes are probably the state-of-the-art in current code

treatment of egress identification through tactile means.

- o The Federal Housing Administration's (FHA) Minimum Property Standards (MPS) for various building types.
- o ANSI Accessibility Standard: this standard addresses fire safety for handicapped individuals only in its warning system provisions, which primarily address the problems of individuals confined to wheelchairs.

### 3. Codes and Standards Philosophy

There exists at present no consensus on a philosophy that should underlie codes and standards responsive to the life safety needs of handicapped individuals. Some of the issues identified as warranting consideration in the development of such a philosophy include:

- o Nondiscrimination in safety measures (identical safety). Safety measures should be the same for both handicapped and able-bodied individuals.
- o Equivalent safety. The handicapped should be as safe from life-threatening conditions as the able-bodied, although there may be different strategies for providing safety for the handicapped.
- o No detriment to the freedom of the general public. Life safety measures for the handicapped should not increase life safety threats to the able-bodied. Instead, measures for handicapped individuals should be designed to increase the general public safety.
- o Highest risk/least ability criterion. Safety measures might be designed to provide adequate protection for individuals with the least capability for self-protection.
- o Right to risk. Handicapped individuals should be as free to accept risk as their able-bodied counterparts. Denying the handicapped access to facilities open to the general public is unacceptable as a safety measure.
- o Right to information. Handicapped individuals should have access to the information necessary to deter-

mine their level of risk, in light of their specific handicaps, in different building types.

It was agreed by workshop participants that each of the above statements of philosophy is valid and important in one sense or another. It was also noted, however, that conflicts exist, both among these statements themselves and with other social concerns.

#### 4. Problem Areas

Problems related to codes and standards responsive to life safety needs were identified in a number of areas: In the following listing, problems with higher priority are preceded by an asterisk.

##### General Problems:

- \*1. There is a lack of data, in a form useful for making code decisions, that relate the disabilities associated with specific handicaps to various building types and uses.
- \*2. There is no distinctive data base on the actual experiences of handicapped individuals in emergencies.
- \*3. There is limited information on the abilities and disabilities of handicapped individuals in using building safeguards and safety features designed for the able-bodied.
- \*4. There is a tendency, in codemaking bodies, to categorize all handicaps together, impeding efforts to resolve problems related to specific handicaps.
- 5. There is no clear philosophy apparent in current codes and standards in relation to ensuring the safety of handicapped individuals.
- 6. Codes and standards have historically been based on data on the abilities of the able-bodied. The exceptions to this have been life safety provisions designed for hospitals and other facilities devoted specifically to the disabled.

##### Information Transfer Problems:

- \*1. Current modes of occupant notification of initial threat are ineffective for individuals with certain handicaps.
- \*2. Current modes for occupant location of exits, areas of refuge, and other safety

- features are ineffective for individuals with certain handicaps.
3. Handicapped individuals are often not provided with information needed to evaluate personal risk in terms of their particular disabilities and the safety measures of the buildings they use.
  4. Current practices do not provide handicapped individuals with a means of obtaining assistance during an emergency.
- Movement Problems:**
- \*1. Handicapped individuals can have problems moving from a threatening situation because they are obstructed by certain conditions or elements that become barriers because of their specific handicaps. These are conditions or elements which are not currently addressed in relevant code provisions and include floor coverings, grates, mats, hardware, illumination, sills, protruding objects, and level changes.
  - \*2. The length of time that it takes a handicapped individual to move away from a threatening situation can be seen as a function of their particular disability. No current code provisions take into account this type of time and distance information on handicapped persons.
  - 3. Handicapped individuals are often incapable of using conventional exit systems. The use of stairs as emergency exits in multi-story buildings does not satisfy the exit needs of individuals with certain handicaps.
  - 4. Traditional elevator standards preclude the use of elevators by either the handicapped or the able-bodied in emergencies.
  - 5. Certain configurations and sizes of corridors can create exit problems for handicapped individuals. This is also a problem area for the able-bodied; it is important for both the handicapped and the able-bodied to be able to immediately grasp a sense of direction when exiting a corridor in an emergency.
  - 6. The size of door openings and opening factors such as hardware can create exit problems for handicapped individuals.
- Protection problems:**
1. The disabilities of certain handicapped individuals may force them to seek safety within the building rather than trying to exit. Current practices may not provide adequate safety for these individuals. In providing areas of refuge from fire and smoke it is particularly important that the individuals expected to use such areas have confidence in their safety.
- Search and Rescue Problems**
- The problems identified in this section are probably not addressable by codes and standards. They are included here as related issues that require further investigation as to their impact on codes and standards.
1. In many building types emergency service personnel are limited in their ability to identify the presence and location of handicapped individuals in an emergency.
  2. Certain conventional rescue techniques (e.g., the use of aerial ladders, some carrying techniques) can pose problems in rescuing handicapped individuals.
  3. The location and type of emergency warning systems may hamper or preclude their use by certain handicapped individuals.
  4. There is a lack of consensus on the value of the use of fire extinguishers by either the handicapped or able-bodied individuals.
  5. Conclusion
- In their discussions on general recommendations for codes and standards for life safety and the handicapped, the workshop participants reached consensus on the following:
1. No means of egress for the handicapped should be either exclusive to them or of a character that would not meet code standards for the general population. If it is determined that different egress strategies for the handicapped would be

beneficial for both the handicapped and the able-bodied these potential egress strategies must be developed to fulfill all requirements for acceptable egress.

2. Codes and standards should be cost-sensitive and should not impose undue burden on society's resources.
3. Codes and standards should be performance-based and readily amendable to take advantage of technological and other advances in life safety.
4. To be credible, codes and standards should be based on adequate, reliable data. At the same time, knowledge gaps should not be allowed to unduly impede the development of useful codes and standards.
5. Codes and standards for handicapped individuals should be developed as integral parts of general life provisions. There should be no separate life safety codes and standards for the handicapped.
6. Codes and standards must be enforceable to be effective.
7. Codes and standards are most suited to controlling physical elements of buildings and other aspects of the built environment. Educational programs, management practices, and other areas affecting the life safety needs of the handicapped are more efficiently dealt with by other means.

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## WORKSHOP 2: EMERGENCY PREPAREDNESS PLANNING

Reported by Sharon L. Machida

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### I. Introduction

The Emergency Preparedness Planning Workshop was the second in a series of six Workshops on Life Safety and the Handicapped convened by the AIA Research Corporation, the Task Force on Life Safety and the Handicapped and the National Bureau of Standards. These workshops were sponsored by the U.S. Fire Administration, and constitute a preliminary stage in the development of a comprehensive policy to ensure the life safety, particularly the fire safety, of handicapped individuals.

The charge before this workshop was to concentrate on the availability, development, and use of emergency preparedness plans to assist in the protection and removal of handicapped individuals during emergencies. Similar to the other workshops, major problem areas were identified within emergency preparedness planning related to the handicapped population, and then these areas were ranked in order of priority. The topic of emergency preparedness planning differed from the other workshop topics in that it is more inclusive; instead of focusing on fires in different types of buildings, this workshop covered different time frames in different types of emergencies/disasters, from earthquakes to fires to nuclear disasters.

The participants at the workshop believed it axiomatic that every individual in the U.S. today has a right to equal protection in an emergency regardless of race, national origin, age, sex or handicapping condition. The handicapped population (approximately 35 million people) have special needs for their protection, and emergency preparedness planning must recognize and deal with those needs. Therefore, the participants felt that this workshop should be concerned with assessing the needs of the handicapped population in relation to emergency preparedness planning and developing considerations to accommodate those needs. The philosophy underlying

workshop deliberations is summarized as follows:

1. Handicapped individuals have a right to protection in emergencies/disasters.
2. Handicapped individuals have specialized needs in emergencies/disasters.
3. Emergency preparedness planning should recognize the needs of the handicapped and plan actions that promote the participation of this segment of the population.

In attempting to isolate specific problem areas in emergency preparedness planning for handicapped individuals, it was felt that the following elements be considered:

- o Type of emergency/disaster;
- o Scale of emergency/disaster;
- o Preventive actions;
- o Response actions.

Although there are differences in meaning and scale between the terms "emergency" and "disaster," they are used almost interchangeably in this paper to mean any situation that precludes the use of normal methods and necessitates immediate action.

The workshop participants defined prior to identification of problem areas, the major steps in emergency preparedness planning as:

- I. Identification
- II. Warning
- III. Rescue

- IV. Evacuation
- V. Relocation
- VI. Emergency
- VII. Recovery

In a later section, the discussion of problem areas is organized according to these steps in the emergency preparedness planning process.

Over the course of the workshop, several ways of organizing a presentation of the problem areas in emergency preparedness planning, and several ways of locating "voids" (areas that need to be addressed before solutions can be formulated) were suggested. Three of these matrix-type systems of organizing information are presented below. These organization techniques may be helpful in the November Conference on Fire Safety for the Handicapped deliberations and in future efforts, but workshop participants felt that there was not enough time to make use of them within the constraints of the workshop.

The following considerations related to scale of emergency/disaster were taken into account as problem areas were identified. As the size of the emergency/disaster increases:

1. Availability of specialized forces decreases.
2. Alarms become less effective.
3. Preplanning becomes more crucial.
4. Relocation becomes more likely; the complexity of relocation increases; relocation areas become more distant; support systems become more impersonal.
5. Credibility in plans decreases.
6. Emergence becomes a factor of greater importance.
7. Logistical problems increase in different ways (time, quantity, distance, communication).
8. The larger the emergency/disaster, the less people are concerned about pre-planning and preparations (e.g., nuclear disasters).

The following section presents the problem areas identified by workshop participants. The asterisk marking some of the problem areas indicates that the problem area is of higher priority. In other words, given a limited amount

of time, money, and human and physical resources, these are the problem areas that should be concentrated on first.

## 2. Problem Areas

### 2.1 General

- \*1. There is a general lack of appreciation of the need for specific consideration of the handicapped within emergency preparedness planning.
- \*2. There exists a lack of consumer input (handicapped individuals and organizations) into emergency preparedness planning through special committees and governmental channels.
- \*3. There is a general lack of communication between the various interfaces (e.g., handicapped individuals: local fire department, local government agency: other involved local government agencies, local: state, state: federal, federal: federal) in emergency preparedness planning. With the addition of specific provisions for handicapped individuals, communication becomes even more important.
- \*4. There exists a general lack of cooperation among responding agencies within emergency preparedness plans.
- \*5. Emergency preparedness planning is by nature complex and, due in part to the different variables involved in different levels of organization, not uniform. Nevertheless, there should be an emphasis on

clarity and consistency within any given plan. Clarity and consistency must be emphasized in efforts to introduce provisions related to the handicapped.

- \*6. There is a need for an adequate data base on the reactions of handicapped individuals during emergencies.
- \*7. There is, at present, no method of demonstrating the effectiveness or the cost benefit of handicapped provisions within emergency preparedness plans.
- \*8. Responsibilities are not always clearly defined within emergency plans (e.g., the division of responsibility between municipal emergency medical services and emergency services is often unclear.)
- \*9. Handicapped individuals should be included in any practice, rehearsal or exercise of emergency procedures.
- 10. There exists a general lack of credibility in the emergency preparedness planning process. Greater credibility must be established if handicapped provisions in existing plans are to be effective. To increase credibility the participation and support of the handicapped population must be encouraged.

## II. Evaluation techni-

ques should be developed to judge the effectiveness and workability of handicapped provisions within emergency preparedness plans.

- 12. There is a lack of proper incentives to promote the incorporation of handicapped provisions within local emergency preparedness plans.
- 13. There is no effective transfer mechanism for moving information through various levels of government (federal-state-local).
- 14. The abilities and talents of individuals with various handicaps need to be recognized and utilized during emergencies (e.g., communication networks already in existence within specific handicapped groups, through CB radios and TTYs, etc.).
- 15. There is a general lack of needs assessment in terms of planning for life safety and the handicapped.
- 16. There exists little information to distinguish plans for the handicapped and for the general public.
- 17. There is a lack of awareness of the importance of centralized operation and direction during emergencies.

### 2.2. Identification

- \*1. There is a need for systematic methods of identifying handicapped individuals within a community.
- \*2. At present, emergency preparedness planners do not have adequate information on the particular needs of individuals with different types of disabilities.
- 3. There is little awareness of the special transportation needs of individuals with certain handicaps in the event of an emergency/disaster. A system could be developed for maintaining inventories of special transports for the handicapped (vans with lifts, appropriate personnel, buses, etc.).
- 4. There is a need for development of methods for identifying segments of cities and communities with high occupancy by handicapped individuals.
- 5. Resources within the handicapped population should be identified and utilized by emergency service organizations.

### 2.3. Warning

- \*1. Appropriate warning systems for individuals with certain handicaps are not in wide use; many types of those that are in use are not stan-
- dardized. Examples of such warning systems are smoke detector/strobe/vibrator systems, TTY's, Micro alert devices, smoke detector/fan systems, and redundant adaptive system with the capacity to give specific verbal instructions.
- 2. There is a lack of immediate warning identification. Warnings and alarms could also give handicapped individuals some idea of what direction they should take and what actions are required.
- 3. There is a lack of methods for verifying warnings; this may be of greater importance to handicapped individuals than to people with greater ease of mobility.
- 4. There is lack of understanding of the ramifications and appropriateness of the time factors involved in adequately warning handicapped individuals. Are short or long term warnings more appropriate for certain emergencies/disasters? Do handicapped individuals need more time? Do we need intermittent visual and audible warnings?
- 5. There is little information on the sensitivity of people with different kinds of handicaps to warnings systems. Considerations in this area are: the degree of

immobility or dependence of an individual may affect his/her perception of risk; warning systems inherently have low tolerance for false alarms; the individual's perception of an emergency plan may have an effect on his/her perception of false alarms.

#### 2.4. Rescue

- \*1. More information needs to be disseminated on training in special techniques for rescuing individuals with certain handicaps.
- 2. There is a lack of knowledge on ways in which the handicapped individual can participate in his/her own rescue.
- 3. There may be a need to develop information and guidelines stressing the need to rescue handicapped individuals first, depending on the emergency, the degree of risk, and time elements. Should handicapped individuals in a given environment be rescued first--even before the emergency is verified--because of their different time needs in terms of rescue and evacuation?

#### 2.5. Evacuation

- \*1. There is a lack of transportation systems specifically linked to the movement of individuals

with certain handicaps.

- \*2. There is a lack of understanding of the time needs of handicapped individuals for preparation for evacuation and actual evacuation.
- \*3. There is a need to further identify and define alternative procedures for the evacuation of handicapped individuals (e.g., buddy systemplanned and spontaneous).
- \*4. There is a lack of understanding of the types of assistance needed by handicapped when evacuating.
- 5. There is a need to identify community groups and other resources that could assist in the organized evacuation of the handicapped.

#### 2.6. Relocation

- 1. The different types of relocation centers needed by different groups of handicapped individuals should be identified and appropriate actions taken to meet the relocation needs of these groups. Considerations like size and accessibility should be considered.
- \*2. There is a lack of information on the care and needs of handicapped individuals within relocation centers.

3. There is a need to investigate how the evacuation of handicapped individuals relates to various types of non-governmental relocation efforts such as relocation by organization (e.g., work place, company, and social-based organizations). The ways in which handicapped associations and service organizations aid in this process should also be investigated.

## 2.7. Emergence

- \*1. People with different types of handicaps may have different time frames for returning to their communities. This should be investigated further and incorporated in emergency plans.
- \*2. The kinds of support systems needed by the handicapped in anticipation of recovery should be investigated.

## 2.8. Recovery

The needs of the handicapped related to recovery will vary greatly with the type of emergency/disaster encountered. When planning for physical and social structure recovery, the needs of the handicapped and the ramifications of their return to normal life should be considered.

## 3. Current Plans with Handicapped Provisions and Other Efforts

During the workshop several relevant efforts were identified. These include current plans that incorporate provisions for the handicapped and other efforts to address the needs of different handicapped populations in emergency preparedness planning. These are:

- o Georgia Disaster Plan: Appendix
  - o Missouri State Plan: The section of the state plan on Nuclear Civil Planning (NCP) requests that local governments identify handicapped individuals in their jurisdictions and identify their transportation problems related to evacuation.
  - o University of Omaha, Community Action Social Services (CASS) has done some work in the area.
  - o National Council on the Aging (NCOA): NCOA held a planning meeting on the elderly and emergencies about a year ago.
  - o Buffalo, New York, has a disaster plan for the elderly and the handicapped which is primarily a snow disaster plan.
  - o Minneapolis, Minnesota: A developmental disabilities group (contact: Doris Harr) has done some work in the area of developmentally disabled and emergencies.
  - o Lincoln, Nebraska: The Lincoln Disaster Plan has provisions for the mentally retarded.
  - o National Institute of Mental Health: There is research being conducted under Disaster Act funds on mental health aggravated by disasters (including effects on people of psychopharmaceuticals). The contact person is Dr. Frederickson, Disaster Branch, NIMH.
  - o Almost every Federal agency has a limited disaster branch. Efforts should be made to identify what each of these isolated branches is doing.
- ## 4. Recommendations
1. Steps should be taken to influence policy decisions and legislation to deal with the handicapped in disaster preparedness and emergency management.
  2. Incentives should be provided to motivate and promote the incorporation of handicapped needs into all levels of emergency preparedness planning. It

is crucial that appropriate incentives be developed to promote integration of appropriate strategies for the handicapped into local emergency preparedness plans.

3. Lines of communication should be developed and clearly defined between the various levels of government in dealing with the handicapped and emergency preparedness planning.
4. At the Federal level, efforts should be made to develop flexible guidelines for emergency preparedness measures incorporating the needs of the handicapped. These flexible guidelines should be adaptable by individual state and local governments for use in their jurisdictions; as one of the participants said, "You give us the skeleton, and we'll put the meat on it."
- \*5. Participation by special groups--made up of representatives from governmental agencies, handicapped organizations, and other groups--in the emergency preparedness planning process should be encouraged.
6. There may be a need for allocation of Federal funds for a pre-disaster discretionary fund for use by state governments in providing emergency services at the time of a disaster.
7. Special groups representing handicapped interests should be encouraged to develop plans and action agendas incorporating their needs related to emergency preparedness planning.
8. There is a need for the development of some type of vehicle(s) for delivering needs and solutions related to emergency preparedness planning for the handicapped to local governments.
9. The awareness level of the general population in regard to emergency procedures for different types of handicapped people should be raised.

Format I. Emergency Preparedness Planning and the Handicapped

Emergency Preparedness Process		GENERAL PLANNING		IDENT.		WARNING		RESCUE		EVACUATION		SHELTER *	
Level of Organization		Existing Methodology and Resources		Actions Needed and Potential Resources		Exist.		Act. Need		Etc.			
FACILITY**	A B B <sub>1</sub>	A B B <sub>1</sub>	ETC.										
COMMUNITY	A B B <sub>1</sub>	A B B <sub>1</sub>	ETC.										
REGION	A B B <sub>1</sub>												
STATE	A B B <sub>1</sub>												
FEDERAL	A B B <sub>1</sub>												

\* Emergency Preparedness Process continues with Emergency and Recovery.

\*\* i.e., individual residences, institutions, business occupancies, etc.

Variable Level A: Type of handicap (i.e., multiple, motor, visual, hearing, etc.)

Variable Level B: Type of emergency/disaster (i.e., fire, flood, earthquake, nuclear, hazardous material, terrorism, etc.)

Variable Level B<sub>1</sub>: Scale of emergency/disaster (i.e., intensity, time, distance, etc.)

**Format 2.** Charts for each level of organization (Facility, Community, Regional, State, Federal). For example:

Type of Handicap	FIRE	EARTHQUAKE	FLOOD	NUCLEAR	EXTREME WINDS	ETC.
VISUAL	1 2 3	1 2 3				
HEARING	1 2 3					
MOTOR						
MENTAL						
ETC.						

1. Pre-Emergency Planning (including education, prevention, training, responsibility)
2. Warning
3. Response

**Format 3 Time Factors/General Functional Requirements**

Time Factors	PRE	TRANS	POST
General Functional Requirements	Identification	Warning Rescue Relocation Evacuation	Emergency Recovery

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## WORKSHOP 3: BUILDING DESIGN

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The Building Design Workshop was the third in a series of six such workshops convened by the AIA Research Corporation, the Task Force on Life Safety and the Handicapped, and the National Bureau of Standards. These workshops have been funded by the U.S. Fire Administration for the purpose of developing position papers which will serve as the basis for a November 1979 Conference on Fire Safety for the Handicapped. By the culmination of the project, which is a unique attempt to collect information on the national level, 150 individuals will have been involved, including representatives from the Federal Emergency Management Administration, the Defense Civil Preparedness Agency, The American Institute of Architects, and the National Bureau of Standards. This particular workshop took place on 10 September 1979; participants are listed on page 5 of this report.

The stated objective of the meeting, which was chaired by Richard Klinker (General Services Administration), was to identify problem areas in building design with regard to fire safety for handicapped individuals. It would be safe to say that participants in the workshop found certain difficulties with this, largely due to the broadness of the topic area, the complexity of the issues involved, and the shortness of the time allotted for the meeting. However, after much discussion and argument, some of these problem areas were identified, and the role of building designers in solving the problems was discussed.

A general statement of the philosophy or basic assumptions of the meeting was provided by Dr. Anne Phillips, one of the participants, and is as follows:

The basic concepts needed in building design for the safety of the handicapped are much the same as those for

protection of the ablebodied. Limiting the size of the fire and controlling the spread of fire gases so that most of the building is tenable will save lives in both groups. If design for fire safety for the handicapped is to be rational it should be carried out in total design concepts. The designer must plan for (1) management of the fire; (2) horizontal movement of the building occupants to safety areas (which is more rapid and less likely to result in accidents than vertical movement); (3) evacuation of the occupants; or a combination of these. Within the existing catalogue of devices and equipment are many of the means of accomplishing these objectives. Defending in place would obviously be optimal.

To consider the handicapped en masse is an exercise in futility. The needs of the wheelchair patient are different from those of the deaf, the blind, the aged, the infant, the restrained, and the inebriated. Even the term "handicapped" presents difficulties since many of the so-called "handicapped" consider themselves only "physically inconvenienced".

Absence of data on fire injury in the handicapped population adds to the complexity of the problem, although common sense tells us that fire safety for the handicapped has shortcomings and technological advances should be developed for their assistance.

The problems considered by this panel were those of people having difficulty

in perceiving a fire threat or in responding to such a threat. We addressed ourselves mainly to those who are blind, deaf, or in wheelchairs, but who are able to enter and leave a building independently. Moreover, we identified areas needing attention rather than reaching definitive solutions.

During the initial stages of the meeting, a fair amount of time was spent in discussion of the term "handicapped", as Dr. Phillips has mentioned above. One participant definitely preferred the term "physically inconvenienced" to "handicapped", while two other participants each had their own methods of classification of disabled individuals. The first method broke handicapped persons into the following groups: those who have difficulty perceiving the threat; those who are incapable of analyzing the meaning of the threat; and those who have difficulty reacting to the threat, once its meaning is understood. The other method broke people down in a similar fashion, with more emphasis on egress from the building. This method is as follows: the buildings themselves; all users of the building who should know what to do in case of emergency; those who will not know what to do, and who will need to be cared for; and those who physically cannot help themselves out of the building. The essence of the conversation was that classification was another complex issue, and that building solutions could easily be bogged down in unclear definition of projected building users.

One of the basic problems for designers is that there is a tendency to put all handicapped persons together as a single consideration in programming the building. This often results in stereotyping handicapped individuals as a single model person, usually represented by a figure in a wheelchair. For the designer, the primary consideration is the relationship of the handicapped person to the environment, both physical and social, in which he/she will have to exist.

For the most part, the aspect of building design which was most emphasized in the meeting was that of egress for those who are handicapped. The handicapped today often have only one means of egress, although two are regarded as essential for people with optimum mobility. A conflict becomes evident here, between issues of ingress and egress: after all this struggle to make buildings more accessible to those with physical disabilities, what about making these same buildings easy to evacuate? The problem obviously should not be dropped as a callous, "Well, they got in, so they must be able to get out." At this juncture in the meeting, the issue of personal risk was raised, as it was in

almost every other workshop in this series. The point was made that handicapped individuals live at higher risk customarily; shouldn't they simply have to accept this, whether with regard to buildings or not? Why should buildings be designed for the handicapped so that "normal" people must operate at the same level of precaution?

The group continued on to discuss social responsibility; is it a social need that everyone receives equal protection under the law? that everyone be told how to cope with an emergency situation that could potentially affect them? The general feeling was that there was a social responsibility for this kind of protection, largely based on the fact that the American evaluation of risk has changed drastically in this century, and that it is much less acceptable for people to die as a result of building dangers or disasters.

Problem areas which were identified at the meeting can be loosely classified according to the following headings: notification, protection in place or horizontal removal/movement, and total evacuation. These problem areas are, for the most part, user-oriented and may vary according to building type.

#### I. Notification

Currently, designers face the problem that they are provided with information on handicapped persons in terms of physical and mental disabilities, whereas they need this information in terms of primary human response capabilities (sensing, understanding, and responding to the threat). There is a particular need for information on the individual's ability to move horizontally or vertically within the building, the space that is required for such movement, the strength that is required for movement and handling doors, latches, etc.

1. There exists a need to identify those individuals who, in emergency situations, would need special notification and some type of assistance. The accomplishment of this task would also require the identification of those individuals who would be capable of assisting the handicapped, and the type of assistance which would be required, should such a situation arise. This would be necessary for all building types, especially in transient situations, such as hotels/motels; however, these precautions should also be taken in such building types as offices, multi-family or highrise residential buildings, and other facilities which encourage use by

the handicapped.

2. There exists a need for a higher level of information transfer, in order to give the handicapped the necessary information about the building, the threat to the building, etc., which will assist them in making decisions. Certain types of handicaps/disabilities hinder an individual's ability to perceive and evaluate a fire threat, due either to sensory or mental disabilities, or to a lack of information about the building they are occupying.
3. There is a need to investigate innovative alarm systems which would have the capabilities of notifying the deaf or hearing-impaired, or the blind, of a fire emergency.

Current fire alarm systems fall short of meeting the needs of the handicapped who have less time to search for and reach areas of safety than do the able-bodied. Signals are not differentiated, and fail to instruct the handicapped as to the action to be taken. A person with limited vision, unless given adequate instructions, may move toward the fire instead of away from it. Even able-bodied people may have difficulty hearing alarm bells which sound in corridors, and, for those who are sleeping soundly or hard of hearing, the alarm system may be totally inadequate. The possibility should be investigated as to whether motel/hotel occupants could be alerted through their room telephones or television sets. Another approach may be to have rooms with special devices (installed or portable) for alerting the deaf.

## 2. Protection in Place/Horizontal Movement

Essentially, the protect-in-place concept, while sounding difficult, is a common one in American building design, and is inherent in many of our current building codes for certain building types. Older apartment buildings generally had thinner walls between units, and suffered from the potential transfer of fire from unit to unit. The tradition of compartmentation, in which each apartment is a defense against every other apartment, probably had its origin in the New York City Tenement Act of 1910, and has been an eminently successful method of

designing buildings since then. In other communities where there has been a conscious effort to develop compartmentation techniques, the failure to provide substantial doors and door closers or other compensating features (such as corridor sprinklers) has resulted in problems of fire spread from one apartment to the next, causing injuries to both people and property in adjoining units.

Problem areas under this category are as follows:

4. There is a need to convey the designer's concept for the building by means of the building's management scheme, and assure that it finds its way into the hands of the handicapped individual who needs this type of information in case of emergency.

Some handicapped persons need special instructions on how to use the building during an emergency; these instructions must be tuned to the specific design and construction of the building and the ways in which it will operate under fire conditions. It is up to the building management to make sure that any handicapped persons in the building receive this information in a manner which is useful to them.

5. There exists a need to identify the two categories of people who need to be protected in place in case of an emergency.

These classifications break down into two groups: those who need a place of refuge within the building envelope, those who require extended-time evacuation.

## 3. Evacuation

It is axiomatic that the best place to be during a fire is not in it. If it happens, however, that an individual is caught in a fire, then the logical thing to do is to get out of it. The problem is that this may not in fact be true, that the very act of leaving a building may take a person

from a relatively safe area closer or right into the area of greatest risk. Therefore, it must be recognized that some of the safety precautions which are urged upon people are anti-intuitive, and instructions are necessary. This may be a particular problem for a disabled person, if his/her handicap makes traveling the exit route difficult or extraordinarily slow, or if his/her sensory or cognitive capabilities prevent him/her

from recognizing the threat.

6. There exists a need to relate the building design to the actual needs of the handicapped persons who will be using the building, and not to presume that they will always be on their own, nor to assume that they will always receive every bit of assistance that they need.
7. There exists a need to develop effective exit lights in stairwells.

A strobe light in the stairwell has been shown to accelerate evacuation by lending a sense of urgency, and also to provide (if there are windows) a guide for the fire department in locating the fire. In addition, a sound source located near the exit would aid the blind and those blinded by smoke.

Also, for both those with reduced mobility and the able-bodied, there is a need for dual exit lights, one set being installed where it can be seen over the heads of others, and a second set near the floor, which can be seen when there is thick smoke obscuring the upper set.

Once the discussion shifted to the question of optimal building solutions, several points were made which are crucial to the results of the meeting, and in a larger sense, to the whole topic of design for the handicapped.

- The most desirable solutions are those which leave the greatest number of options open for as long as possible. This refers to questions which were raised about the fact that two means of egress are required for the able-bodied, yet usually there is only one for handicapped individuals.
- Building solutions cannot depend solely on the education of the individuals who will be involved in the building. The solutions must be readily comprehensible to anyone without special training; it is unrealistic to expect that people will be adequately trained in how a particular building works.
- Circumstances must be identified in which the responses of the handicapped are as possible, and just as effective, as those of the able-bodied.

Recommendations for work on potential building solutions were developed in order of the

highest priority, and are presented here.

1. Highest priority must go to work on that part of the design which is the least known. From the group's discussion, it appeared that the issue least understood was that of the limitations of handicapped individuals in relation to the building's design features (ex.--internal methods of communication, signals, transportation within the building, and operation mechanisms).
2. For fire-safe design, it is not possible to derive all of the solutions from existing technological information about equipment, devices, and capabilities. A significant portion must be derived from the careful examination of incidents and human reactions to those incidents, whether successful or unsuccessful. Unfortunately, there is currently little data on the behavior, number of injuries, etc., of handicapped individuals in fires.
3. The third priority is the necessity of providing technical design information on equipment and devices in terms of values which can be measured with regard to the abilities or disabilities of handicapped persons. This is most important for those with sensory handicaps. Currently, it seems that most experts are promoting single-dimensional solutions, and asking designers to convert to those solutions. Ideally, it is necessary to develop a wide range of effective solutions or approaches (quantitative in nature) to allow for variations and alternatives in a design for the handicapped.

The general sense of the committee was that basic information on fire protection design and the elements involved in meeting the basic objectives of preventing ignition, fire management, and protecting individuals exposed to the fire exist and are in usable form. Obviously, better design and research can improve knowledge in this area. What is very much missing from the state-of-the-art is basic knowledge on the capabilities and susceptibilities of the handicapped individual.

The ultimate goal is to broaden designers' understanding of user needs for buildings. Specifically, there is a need to train and inform

designers on the handicapped and their needs in buildings; designers must understand that the handicapped, while needing design attention, are just one of the many types of people who use buildings. Ideally, design for the handicapped should simply be better design for everyone, a total design which is a meshing of the needs of the handicapped with all other needs and the building program in order to come up with a design which satisfies, both functionally and aesthetically.

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## WORKSHOP 4: EDUCATION

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### I. Introduction

The Education Workshop was the fourth in a series of six Workshops on Life Safety and the Handicapped convened by the AIA Research Corporation, the Task Force on Life Safety and the Handicapped, and the National Bureau of Standards. These workshops were sponsored by the U.S. Fire Administration and constitute a preliminary stage in the development of a comprehensive policy to ensure the life safety, particularly the fire safety, of handicapped individuals.

At the present there is very little material available on the subject of fire safety for the handicapped and, nationwide, programs for educating both the handicapped and the able-bodied in the special problems of fire safety for the handicapped are few and far between. In recent efforts to find programs and educational materials that address fire safety and the handicapped, the U.S. Fire Administration's Office of Planning and Education identified the following:

Special programs developed by municipal fire departments:

- Mount Prospect (Illinois) Fire Department fire safety education program for the hearing-impaired in high schools;
- Chicago (Illinois) Fire Department's Fire Education Bureau's work within its Neighborhood Awareness Program;
- Las Vegas (Nevada) Fire Department, Fire Education Bureau's work with the hearing-impaired, including a pantomime play, "What To Do In Case Of A Silent Fire" (the Fire Education Bureau has a brochure which includes a section on "Services to the Handicapped");

- Montclair (California) Fire Department's Residential Fire Safety Program for handicapped, disabled, and elderly homeowners.

#### Educational materials:

- Three programs have translated fire safety educational materials for able-bodied individuals into Braille for use by the visually-impaired;
- "Wheeling to Fire Safety: Fire Emergency Procedures for Paralyzed and Other Handicapped People," a brochure produced by the Eastern Paralyzed Veterans Association;
- "Fire Safety for You: A Guide for Handicapped People," released by the National Fire Protection Association.

The workshop participants were invited for their experience in teaching the handicapped, or their involvement in special fire service programs such as those mentioned above. The workshop participants are listed on the last page.

The general question before the workshop participants was: What are the current fire education needs of handicapped people? There was general agreement at the outset of the meeting that not only are there very few materials available for educating people in fire safety and the handicapped, but also there is little awareness of the very real problems faced by handicapped individuals in emergencies. Due to time constraints, discussion at the workshop centered around fire safety in the home rather than in other occupancy types. The six specific questions addressed by the participants were:

1. In what ways would the content

- of fire safety materials for the handicapped differ from the content developed for non-handicapped individuals? Can material developed for the non-handicapped simply be adapted for the handicapped?
2. How is fire safety education for the handicapped to be conveyed? What form (film, record, brochure) do the materials take?
  3. To whom should fire safety education for the handicapped be conveyed? Handicapped adults? Primarily handicapped children? How? Through special community meetings? Classes at school? Fire Department demonstrations?
  4. What organizations, agencies or persons would support the development and dissemination of fire safety education materials for the handicapped? Who could provide technical assistance? What organizations could provide funding? How could the material be distributed to the user?
  5. What fire safety issues need to be identified for the handicapped out side of the home?
  6. Who needs to be knowledgeable about fire safety for the handicapped other than the handicapped?

## 2. Content

The same kinds of precaution and safety measures that are stressed in fire safety education for the general population also apply to the handicapped. However, it is much more crucial for the handicapped to follow general fire safety rules since they are less able to escape threatening situations than the non-handicapped. Thus, more than content, the differences lie in the degree of emphasis given to various key elements of fire safety. For example, it is extremely important that handicapped individuals register with their local fire departments. Two other elements that would be most stressed in education for the handicapped are practice (of self-defense strategies, escape, etc.) and maintenance (of viable escape plans for different types of emergency situations, appropriate alarm systems, etc.).

In terms of specific fire safety messages, there are some differences in content depending if the messages are directed to able-bodied or handicapped persons. Fire safety messages for the general population consist of two kinds: 1) What you (the potential victim of a fire) can do to prepare for a fire situation (e.g., escape planning, notifying fire department, installing smoke detectors); 2) What to do in terms of preventing potential fires (e.g., identifying home hazards, improving personal safety habits). The following charts -- Figure 1.: What You Can Do; and Figure 2.: Prevention -- present the workshop participants' recommendations for a potential brochure of fire safety messages for the handicapped (as well as the able-bodied, who will also be involved in prevention and action processes that include participation by handicapped individuals).

The entries on the charts are extensions of good fire safety practice or give special emphasis to some element of standard fire safety. In both charts, specific safety messages are referenced to types of handicap, which were limited to movement, hearing and visual handicaps. Specific content and trade-offs related to other handicaps and multiple handicaps were not addressed in this workshop due to time limitations.

## 3. Teaching Methodology

How is fire safety education for the handicapped to be conveyed? What form do the materials take?

There was a general unstated consensus to concentrate on teaching children -- handicapped and non-handicapped - fire safety education for the handicapped. The workshop participants felt that education in fire safety for the handicapped could be a vehicle for simultaneously teaching the non-handicapped the necessity of following good fire safety practice. Although it was noted that we must not ignore the institutionalized population -- those in nursing homes, special schools, etc. -- the participants did not address teaching methodologies specifically keyed to institutional settings.

The vast majority of handicapped children are in public school; it is estimated that only 10 percent of the handicapped are institutionalized. In general, there is a need to integrate the teaching of fire safety for the handicapped with general fire safety education. A handicapped child could be used in fire demonstrations. For example, by having a blind student participate in a demonstration of putting out a fire in a trash can, two things are accomplished: 1) the blind student has gained valuable practice in putting out a fire; 2) the non-handicapped students have gained a visual lesson, which for them is just as valuable as the blind student's tactile experience.

There is a need to train fire service personnel in fire safety for the handicapped. This is especially crucial in communicating with the hearing-impaired. Children identify with fire fighters; fire service personnel who give demonstrations in schools should integrate special messages for the handicapped children into those demonstrations.

Parents can be reached through education of their children in public and specialized schools. Efforts at giving the problem wide coverage through TV public service announcements could also be made. A symbol on the order of "Smokey the Bear" could be developed to publicize life safety and the handicapped.

A summary of considerations in teaching methodology related to specific handicaps is given below.

#### Movement-impaired:

People restricted to wheelchairs need to be aware of and practice the different escape and fire safety strategies they will need in the event of fire. When teaching children in a school setting, educators may want to isolate this group for specialized instruction which would differ from that for the visually-impaired, hearing-impaired, and the non-handicapped. All groups should be aware of the basic fire safety strategies for those restricted to wheelchairs.

#### Hearing-impaired:

Communication skills are the most important factor with this type of handicap. Two issues of importance are:

- Training of communicators (fire personnel, teachers, etc.) in fire safety for the handicapped;
- Vulnerability of the hearing-impaired. Fear arousal may be greater because when alarms go off, or strobe lights, or visual clarity is obscured by smoke and confusion, a non-hearing person is more vulnerable than a hearing person.

Specific points related to teaching methodology and teaching materials:

- The best vehicle for teaching fire safety is live demonstration, preferably by two people -- a fire fighter (who uses vivid pantomime and other means to convey the fire messages) and an interpreter. Since any group of hearing-impaired individuals will have individuals with widely varying levels of auditory perception, pantomime, speaking, and translating

will result in a valuable learning experience for every individual in the audience.

- Demonstrations could be reinforced with captioned TV programs and films. Films and TV programs developed for an audience that would include hearing-impaired individuals should have a lot of action, be physically descriptive, colorful and have some humor. Characters in such a program should have readable lips: of two films currently used in fire safety education -- "Learn Not to Burn" with Dick Van Dyke and "The Donald Duck Survival Plan" -- the Dick Van Dyke film is more understandable to hearing-impaired lip readers, even though the physical action in the Donald Duck film is more descriptive.
- In demonstrations, plays, and in class, use pantomime as a teaching tool. Concepts like stop/drop/roll and the use of fire extinguishers are effectively conveyed to hearing-impaired children and adults through pantomime. But an inherent danger is that educators cannot afford to make any errors that may become fixed in the minds of the learners.
- In all demonstrations, films, and literature emphasize positively reinforced messages. For example, if the message is "don't play with matches in the closet," do not show children playing with matches in the closet with only the audio or written portion giving the negative message.
- Be sure that the hearing-impaired student understands. This is assured through creative repetition -- repeating the lesson in different ways.

Often, a hearing-impaired student will nod understanding when he/she doesn't understand, in order not to inconvenience the teacher, who will have to repeat the information.

#### Visually-impaired:

In teaching materials geared to the visually-impaired, make use of all the media available. Even though it is estimated that only 10 percent of the blind can read Braille, it is still worthwhile to make Braille materials available, as well as audio cassette tapes and large print. As mentioned above, hands-on demonstrations using visually-impaired participants also give non-handicapped participants visual education. Educators should try to emphasize the tactile in teaching

fire safety.

#### 4. Whom? How?

To whom should fire safety education for the handicapped be conveyed? At this point in the workshop the answer was relatively obvious: as many people as possible should know about fire safety for the handicapped, through as many means as possible. Some of the means of educating people about fire safety for the handicapped have been discussed in previous sections. Other methods are:

- National organizations for different groups of handicapped individuals Fire safety messages could be conveyed through annual meetings, newsletters, seminars and other means open to these organizations. Such organizations include:

National Federation for the Blind

National Association of the Deaf

Council of Organizations Serving the Deaf

Eastern Paralyzed Veterans Association

National Paraplegic Foundation

- Distribution of all materials developed for use in the waiting rooms of doctor's offices, hospitals, and other types of institutions.
- Social clubs (informal groups of handicapped individuals or sports groups like the American Athletic Association of the Deaf).
- Community meetings and churches (there are special churches for people with different handicaps).
- Teacher organizations like the Association for the Education of the Visually-Handicapped and special education organizations.
- A clearinghouse system which could be established at libraries servicing handicapped individuals.
- Programs on fire safety for the deaf with visuals and signing such

as those which the Osmond Brothers will start in January 1980. Other national education efforts may also be in preparation.

#### 5. Organizations and Agencies

What organizations, agencies or persons could assist in development, funding and dissemination? Beyond those groups already mentioned above, the fire service organizations are definitely to be considered in all these efforts. In fact, it has often been the fire service that has prompted action on behalf of the handicapped. Also lists of organizations and agencies are disseminated by the national foundations for specific handicaps. There are national, state, local, and school groups for the visually-impaired, hearing-impaired, and orthopedically-impaired. Some organizations not previously mentioned include:

Federal government agencies:

-Bureau of Education for the Handicapped (USOE)

-Office for the Handicapped (HEW)

-Veterans Administration

-Maternal and Child Health Service (HEW)

Other organizations:

-Alexander Graham Bell Association

-American Coalition of Citizens with Disabilities

-Association for Citizens with Retarded Human Development

-Epilepsy Foundation

-Center for Independent Living

-American Foundation for the Blind

All the organizations mentioned so far could be of help in developing materials and disseminating them. There are also consumer groups and medical research organizations.

In terms of funding, the following options were brought out during the workshop:

- Insurance companies
- Local civic groups (e.g., Lions Club, Kiwanis Club)
- Department of Housing and Urban Development, Community Development

Block Grant Program. In Montclair, California, the Community Development Block Grant allocation under the Montclair Rehabilitation Loan and Senior Repair Programs enables fire department personnel to assist in the installation of smoke detectors and fire alarms, wheelchair ramps, fire escape hatches and other types of devices necessary in the homes of disabled and handicapped individuals with low incomes.

- Other avenues within the federal, state, municipal governments.
- Municipal bonds. The State of California has a Redevelopment Plan which allocates 20 percent of the revenue of the sale of municipal bonds to a program similar to the Community Development Block Grant Program.
- Title 5, Older Americans Act (Department of Labor). Supports such programs as fire inspections conducted by senior citizens in the homes of elderly and the handicapped.

## 6. Outside the Home

What issues need to be identified related to fire safety for the handicapped outside the home?

1. All educational messages must be basic and simple. For example, "keep alert, look around."
2. Individuals must be aware of escape planning when in different types of buildings, and familiar with exits.
3. Section 504 of the Rehabilitation Act, which is concerned with problems of access, states that there must be "reasonable accommodation" in theatres, stadiums, and other types of public assembly buildings. Handicapped people should be aware of the egress problems they will have in those types of environments. Seating should be based on informed choice, not segregation.
4. Individuals must be able to find exits and refuge areas. Although a few buildings have good warning systems for individuals with movement, hearing, and visual impairments, most buildings will only have an audible system. Work needs to be done on exit identification and escape procedures in offices and public buildings. This area is largely a matter of education, product devel-

opment, consumer interests, and codes.

5. Building managers must be responsible for the maintenance of all alarm systems. Even though products may be available, codes in place, a sturdy educational system in operation, it is still the ultimate responsibility of the building manager of a public building to maintain all the alarm and escape systems.

## 7. Who Else Needs to be Knowledgeable?

Who is responsible for fire safety for the handicapped? The consensus of the workshop participants was that everyone has a moral and social responsibility to be at least aware of the issue of fire safety and the handicapped. In terms of legal responsibility, Section 504 of the Rehabilitation Act only covers access, not egress, in emergencies. The burden of responsibility lies with the handicapped individual. Handicapped people must take it upon themselves to be aware of their escape options in every building they enter. Other related issues are the handicapped individual's right to risk and the potential for panic that can occur in a real emergency.

Public officials should be knowledgeable about the problems involved in ensuring fire safety for the handicapped. One avenue for raising the level of awareness among public officials is to give "handicap days" a new twist -- by calling a fire drill while a city council member is confined to a wheelchair for a day.

Through all means possible, awareness of the problems and knowledge of possible solutions and educational methods for implementing these solutions must be fostered. Special target groups are the fire services, handicapped groups, educators, and youth.

## 8. Conclusions

The participants unanimously voiced the conviction that educators in fire safety are responsible for: 1) educating themselves in the special needs of the handicapped; and 2) teaching the handicapped and the able-bodied effective strategies for fire safety that would result in greater fire safety for all. The handicapped must educate themselves and be aware that they are ultimately responsible for knowing their options in any environment in the event of a fire or other emergency. The able-bodied must be aware of ways to assist in the safe evacuation of handicapped individuals in their families, workplaces, and in other social environments.

At the close of the workshop, individual

participants voiced concerns they felt to be of the greatest importance in the area of education in fire safety and the handicapped.

1. In order to make the greatest impact on how people react to fire situations when handicapped people are involved, training programs should focus on youth from as early on as possible. Educational materials for children should emphasize that there are certain things that handicapped persons, regardless of the specific disability, can control while not misleading them about the things they cannot control.
2. Life safety for the handicapped is analogous to the civil rights movement, another case of "it should have been done ages ago, but it wasn't." The handicapped have been discriminated against in terms of safe egress from buildings in emergencies for years; the handicapped population has the same rights as does the general population; and the right to safety must not mean denial of access. In terms of education, there needs to be a movement toward total behavioral modification as regards the total population's perception of its handicapped members.
3. Some thought must be given to priorities. Is it more important to focus our efforts on egress from highrise office buildings or on egress from homes for the elderly? Many areas need to be addressed but we are not yet clear on a research, development and information dissemination agenda.
4. Resources need to be pooled. This may largely be solved by projects like the Workshops and the November Symposium. In most cases, programs and product development are so new that people are not aware of others working in the same area.
5. Due to an accident suffered by a workshop participant, a primary group of handicapped people not represented at the meeting were those with mental disabilities. All groups of individuals must realize that they are ultimately responsible for themselves, including the educable mentally handicapped,
6. although there must be efforts to raise the awareness of the general public.

FIGURE 1. WHAT YOU CAN DO -- Preparation for and in a Fire Emergency

Type of Handicap	Fire Safety Message	MOVEMENT	HEARING	VISUAL
HOME FIRE	<ul style="list-style-type: none"> <li>● Escape</li> <li>● Call FD</li> </ul>	<p>*Practice and time alternate escape options.</p> <p>Establish an emergency contact system via telephone, friends, signals, etc. This is crucial if you live alone</p> <p>Be aware of fire safety in location of bedrooms in location of bedrooms</p> <p>Survey House for at least two escape routes depending on type of fire emergency and length of warning time.</p> <p>*Notify FD of your location and specific disabilities. Red Dot and I Sticker Programs (problem: security).</p> <p>Keep a small tank of O<sub>2</sub> in bedroom, or other escape breathing device (problem: overconfidence).</p> <p>Have available some device (a battery operated flashing light in bedroom window, for example) to signal your location. This device could be automatically activated in the event of fire.</p>	<p>Remove obstacles to egress. Be aware of certain things becoming obstacles in the event of fire (rugs, etc.).</p> <p>Install ramps and doors which can be opened easily.</p> <p>Survey house for escape routes.</p> <p>*Establish communication system with FD, through neighbors, TTY, telephone pre-recorded tapes, etc.</p> <p>Survey house for at least 2 escape routes</p>	<p>*Practice fire safety measures and escape procedure. Repeat often, physically act them out.</p> <p>Replace windows with sliding sliding glass doors</p> <p>Survey house for at least 2 escape routes</p> <p>*Notify FD. Register</p> <p>Escape fire situation first, then contact FD from neighbor's house</p> <p>*Notify FD. Register</p> <p>*Notify FD. Register</p>

FD = Fire Department

\* = of great importance

\*\* Points below are applicable to paraplegics.  
It is assumed that quadraplegics will live with others who know and practice emergency fire evacuation.

FIGURE I. WHAT YOU CAN DO (cont'd)

Type of Handicap Fire Safety Message	MOVEMENT	HEARING	VISUAL
CLOTHING FIRE Putting it out	<p>Keep fire retardant blankets handy. Wear fire retardant clothing. Use fire retardant fabric for wheelchair</p> <p>Have available a small Haylon fire extinguisher (problem: Haylon is slightly toxic and is not yet available in spray can size.)</p>	<p>If feasible, throw yourself out of the wheelchair and roll.</p>	<p>STOP/DROP/ROLL</p>
WARNING DEVICES What is needed beyond standard audible fire alarms and smoke detectors?		<p>Install smoke detectors in every room.</p> <p>Have some kind of outside alarm that would alert neighbors and fire service (audible and/or visual).</p>	<p>STOP/DROP/ROLL</p> <p>Make sure that fire alarms do not entirely mask sound location cues. Alarms must be intermittent.</p> <p>Have existing alarm systems adjusted in terms of frequency and decibels so that the alarm is still sufficiently alarming but not totally disorienting.</p> <p>Self-made detector systems may become fire hazards in themselves due to faulty wiring, etc.</p>

FIGURE 2. PREVENTION

Type of Handicap	MOVEMENT	HEARING	VISUAL
Fire Safety Message			
HOME HAZARDS	<ul style="list-style-type: none"> <li>• frayed wires</li> <li>• coiled cords</li> <li>• rubbish</li> <li>• flammable liquids</li> <li>• octopuses</li> <li>• fireplaces</li> <li>• stoves</li> </ul> <p>With constant floor contact absolutely do not have wires running underneath rugs.</p> <p>Have your home checked out by the FD for any overlooked hazards.</p>	<p>When using heat sources, make sure there is enough air space around the heat source. Isolate heat sources from other objects, especially flammable ones.</p> <p>Have check lists in Braille on fire safety and fire preven- tion posted in conspicuous places in your home.</p>	
PERSONAL SAFETY HABITS		<p>In regard to personal safety habits, the issues are not that different between the handicapped and the non-handicapped. But, certain things do take higher priority:</p> <ol style="list-style-type: none"> <li>1. Practice escape, thereby increasing your confidence level in your ability to get yourself away from a threatening situation.</li> <li>2. Notify the FD of your address and your specific disabilities.</li> </ol>	

\*Closing doors at night is the standard reinforced message in fire education, but it was noted at the workshop that if smoke detectors are not installed in every bedroom, it is safer to keep bedroom doors open so that the hall smoke detector is clearly audible. Also, if the bedroom door is closed, there is no detector in the bedroom, and a fire starts in the room, the occupant may die of smoke inhalation before the alarm goes off.

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## WORKSHOP 5: CONSUMER INTERESTS

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### I. Introduction

The Consumer Interests Workshop was the fifth in a series of six such workshops convened by the AIA Research Corporation, the Task Force on Life Safety and the Handicapped, and the National Bureau of Standards. The workshops have been funded by the U.S. Fire Administrators for the purpose of developing position papers which will serve as the basis for a November 1979 Conference on Fire Safety for the Handicapped. By the culmination of the project, a unique attempt to collect information at the national level, 150 individuals will have been involved, including representatives from the Federal Emergency Management Administration, the Defense Civil Preparedness Agency, The American Institute of Architects, and the National Bureau of Standards. This particular workshop took place on September 17, 1979; participants are listed on the last page of this report.

The workshop, chaired by Ronald Mace, AIA, opened with the statement that consumer interests cut across the topic areas of other workshops, and that the day's discussion could be categorized according to those topics. These topics are Codes and Standards, Emergency Preparedness Planning, Building Design, Education, and Products. One of the basic assumptions of the workshop was the fact that handicapped persons have, of late, become more and more "mainstreamed" into "normal" life. Therefore, they are placed in a much greater range of situations, both emergency and non-emergency.

At this workshop, participants concentrated on the questions of consumer interests with regard to education and training, both their own and that of the personnel who deal

with disabled persons; building solutions and products; and codes and standards. This report will present salient points of the discussion which were distilled from notes and tapes of the meeting. These are not definitive answers; rather, the group focused on raising questions.

In the early stages of the meeting, the group recorded a number of "philosophies," or ideas, which seemed to be undercurrents in much of the work currently being undertaken in the field. These are listed here; several of them are paradoxical, but this is indicative of the problems which are faced in the field.

1. Non-accessibility of buildings to those who are disabled because of fire hazards is absolutely unacceptable.
2. Those persons who are handicapped or disabled have a right to risk as do able-bodied persons; conversely, they have as much right to safety precautions.
3. An increase in fire safety for the handicapped would necessarily increase fire safety for the able-bodied.
4. Some balance between safety/risk and building costs must be reached. What is required is an objective analysis of marginal costs for providing safety features for the handicapped, so that building costs would not be "loaded". This balance is reached somewhat in design for the able-bodied.
5. An awareness of potential emergency

- situations needs to be developed among disabled persons.
6. There is a need to train emergency personnel to assist handicapped persons in case of emergency.
  7. Emergency procedures may need to be developed for the handicapped; the knowledge base needs to be broadened through literature searches, research, and the employment of experts in related fields.
  8. There is a need to identify what handicapped persons need to know in terms of risks, protection, and fire safety.
  9. Coordination and understanding of fire safety procedures and plans of action for handicapped persons need to be developed, with the cooperation and contributions of people who are disabled.
  10. Fire drills and practices should always include those handicapped persons who are present, in order to better identify problems which could arise in a real emergency situation.

Perhaps the single strongest feeling to emerge from the meeting was that handicapped people are not interested in being treated as separate, and different, segments of the population, and that design for the handicapped should be integrated with overall building design from the beginning of the design process.

## 2. Education and Training

This segment of the day's discussion was focused on two areas: the education and awareness of the handicapped individuals themselves, and the training of personnel who deal with the handicapped under ordinary circumstances (assistance-oriented professions).

The most significant problem plaguing the preparation of the handicapped for emergency situations is a general lack of awareness; the handicapped need to be cognizant of the fact that they can be and are placed in situations which are potential emergency situations. It is crucial that they, along with the able-bodied, be aware of this, so that they will be better able to prepare for and deal with emergencies, specifically fire emergencies. The question at hand, therefore, is what do the handicapped actually need as part of their own training to cope with emergencies, once they are aware of their own risks? These are gaps which

need to be identified in future work.

The issues raised so far have been, for the most part, abstract in nature. There was some discussion revolving around practical applications of these ideas. Once those people with any disabilities have been notified of the emergency, there exist, or should exist, certain procedures to be followed under those circumstances. One of the workshop participants made the point that handicapped individuals should always take part in any drills which are held in buildings of any sort as part of their training, in order to identify problem areas in the developed procedures, since many buildings' fire safety features are based on the assumption that handicapped people will not have to travel great distances.

In the area of education and training for personnel who work with the handicapped, the focus is more on communication skills than on notification procedures. At the beginning of the discussion, the participants spoke in general terms about the need for a greater awareness and sensitivity among personnel who deal with handicapped individuals, which could perhaps be developed through existing training programs. As the workshop continued, a specific set of needs was developed.

## Educational Programs to Include Emergency Training

These programs should be provided through:

1. Rehabilitation training systems (in these systems, the training often begins in schools);
2. Training for the general public;
3. Disability service providers;
4. Associations connected with this type of activity, such as the Easter Seals organization.

Major points which need to be emphasized in these types of programs are:

1. That handicapped individuals are, in fact, more vulnerable than the able-bodied in emergency situations;
2. That they must be taught how to handle themselves in emergency situations; different modes of behavior need to be identified for use in these situations;
3. That they must be able to work with others and help others to help them; this requires the development of specific communication techniques.

A major problem is one of security. When local fire departments have lists of disabled persons within their areas of responsibility, in order to more easily locate those who need assistance, there may be a higher incidence of burglary in homes of the handicapped. By the same token, any obvious decal or symbol denoting the residence of a disabled person is also a signal to any burglar. It was decided at the meeting that emergency services need these kinds of identification for the handicapped, but the problem is how to let them know without letting undesirables know as well.

Different groups who are involved with buildings should be trained and educated about how to assist disabled persons in emergency situations. These groups include building operators, landlords, and emergency personnel. These occupational groupings are not meant to focus only on residential buildings; they include night clubs, offices, and any other large, publicly-used building as well. Two methods of affecting building managers and landlords are through the Building Operators and Managers Association (BOMA), and insurance companies which provide coverage for the buildings in question. Training programs could also be set up through these organizations.

As far as the training of design professionals is concerned, there is very little attention paid to the issues surrounding design for the handicapped in existing architecture curricula. It was suggested that codes and standards would be useful in helping to make designers and design students more aware of these problems, once some of the suggested features related to safe egress by handicapped individuals are incorporated into the code instruments.

Another issue which was raised was that of the standardization of training programs; participants were referred to the U.S. Fire Administration, which has made some attempt at packaging some programs in this area.

### 3. Building Solutions and Products

For the most part, the discussion in this area focused on problems of products dealing with fire safety, rather than actual building solutions or designs. The statement was made that there is almost nothing in current architectural training practices which touches on the design of products for fire prevention. Currently, there is some work being undertaken in accessibility retrofit, but examples of this work need to be assembled and distributed to a wide audience before they can be of use to the designer.

The participants discussed building

compartmentation: how it is successful for the most part, how techniques of compartmentation have improved steadily during the course of the twentieth century, how it is possible to refer to areas of safety or refuge in a building when talking about methods of "managing a fire" and the occupants of the building in question. One of the problems discussed in conjunction with this idea was that of convincing those people who are not on endangered floors of the building to allow those who are in danger to evacuate from the building first.

Meeting participants felt that, as far as products were concerned, fire safety equipment must be adapted to the people who will be using it. For example, in some hospitals, there are series of fire doors which are held open for stretchers by electrical magnetic devices; in instances of fire, the electricity is cut off, and the fire doors close automatically to the "safe" position. Other safety features which were discussed included railings on ramps or shallow steps for those who rely on crutches or canes for their mobility; ramps at different floor levels; tactile systems for egress identification; extinguishers; smoke detectors; and alarm systems. Most of these products received only cursory attention, but there was a great deal of discussion on various kinds of alarm systems for individuals with different types of handicaps.

The major problem in discussing alarm systems was that of notification of the deaf occupants of a building, which is a complex issue. Different types of alarm systems are appropriate for different building types; for example, a residential alarm for a deaf person might be attached to a device which could vibrate a bed or a couch and notify the person through his/her sense of touch. Another option is to attach a system to a flashing light of some kind (a strobe was suggested), so that the deaf person could respond visually. These types of redundant cueing for alarm systems would be effective for everyone.

Further problems arise here; whose responsibility is it ultimately to provide these special safety features for the disabled who use or who might be using the buildings? Should it be up to the building owners, the landlords, the insurance companies? If the onus of responsibility is on the landlord, then there is incentive for him to discriminate against the disabled person who is looking for a place to live. And yet, there is overwhelming responsibility to provide fire protection for all people in all buildings.

Other features of alarm systems which came under scrutiny were location, pitch (a problem for those who hear only certain pitches), and the amount of information given by the alarm. The point was raised that, with the increasing average

age of Americans, there will be a corresponding increase in aural and visual problems. In fact, the majority of those individuals at present who are described as handicapped or disabled are over 65. Therefore, the developing movement toward universally designed products which would be effective at all levels and for all types of people, is to be encouraged. Standardization of alarm systems in all parts of the country would also aid in the notification, movement, and evacuation of building occupants.

The important question is how many more people can actually be saved by using what kinds of devices?

#### 4. Codes and Standards

Codes address construction issues, rather than the administrative procedures which are involved in providing for the safety of large numbers of people. Unfortunately, building codes, which state the minimum requirements for different features of a building's construction, encourage the satisfaction of these minimums only. A conflict is thus created between what the building should be and the end result.

One of the meeting's participants called for a national review of building codes with regard to life safety for the handicapped. He used as examples of code discrepancies the elevator codes of Massachusetts and Washington, D.C., saying that in Massachusetts, stair-glides are allowed but not non-stationary chairs (i.e., wheelchairs) on escalators; and that the D.C. code insists on enclosed elevators, eliminating the possibility of porch lifts and outside elevators. It was generally agreed that a national review would identify such discrepancies, but that such a review would require an examination of the entire code-making process, in which the handicapped should be involved.

The responsibility of code officials is a major one. Although disabled persons are aware of and willing to take on personal risk when they enter buildings, it is ultimately the building code officials who are responsible for them. This is a philosophical issue which makes the whole question of developing codes for buildings which take into account the special problems of the handicapped very complicated. Hence, the desire among the participants to be involved by representation in the code-making process.

As was mentioned in the preceding section on products, codes could be used to standardize various products and equipment, so that fire safety for the handicapped would be treated on a national level. Redundantly cued alarm systems, smoke detectors with extra features such as

sirens or lights, color-coded exit keys, tactile systems for egress identification--all could be standardized so that they would be useful, not only to the handicapped population, but also to the able-bodied population.

#### 5. Recommendations/Research Needs

Some of the recommendations for research work which were made during the Consumer Interests Workshop are listed here. This is by no means a complete list; it is merely provided to indicate major areas which require work, and to serve as a starting point for further discussion.

1. More product research:
2. Further investigation of the problems of those with neurological disabilities; those with epilepsy, dyslexia, or some kind of drug addiction which renders them incapable of responding in emergency situations.
3. Training of emergency personnel as part of regular fire department training. This should be added to the firefighter requirements (NFPA 100).
4. Use of existing research results on fire-resistive materials for the clothing and furnishings of the handicapped.
5. Advanced fire planning by local and neighborhood fire departments.
6. Coordination and notification of fire safety procedures and plans for the handicapped.
7. Identification of gaps in knowledge of the handicapped with regard to their own levels of risk.

#### 6. Information Transfer Sources

At the close of the meeting, the participants developed lists of sources of information on fire safety and the handicapped; what follows is a list of the sources which were mentioned at the meeting.

- National League of Cities, Washington, D.C., Robert Hill.
- Paralyzed Veterans of America, cf. pamphlet "Wheeling to Fire Safety"
- The Paraplegic News

- Council of Senior Citizens, Washington, D.C.
- Las Vegas Fire Department, Las Vegas, Nevada
- Independent Living Research Utilization (ILRU), "New Options" classes--unfortunately, they give little emphasis to fire safety.
- Michigan Independent Living Center
- The Chicago Institute of Rehabilitation

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## WORKSHOP 6: PRODUCTS

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### I. Introduction

The Products Workshop was the last in a series of six Workshops on Life Safety and The Handicapped convened by the AIA Research Corporation, the Task Force on Life Safety and the Handicapped, and the National Bureau of Standards. It was held on September 20-21, 1979 in Sacramento, California. The workshops were sponsored by the U.S. Fire Administration and constitute a preliminary stage in the development of a program to provide fire safe environments and emergency procedures in buildings for handicapped individuals. This summary paper of the workshop findings was prepared as a basic document for the November Conference on Fire Safety for the Handicapped to be held at the National Bureau of Standards in Gaithersburg, Maryland, sponsored by the Federal Emergency Management Agency.

The charge before the Products Workshop was to concentrate on the availability, need, use and future development of products and systems to assist in providing for the fire safety of handicapped individuals. The specific objectives of the workshop were:

1. To define problem areas;
2. To rank problem areas;
3. To identify the state-of-the-art in product development;
4. To identify the voids that should be filled before the problem areas can be solved;
5. To synthesize the problem areas, existing knowledge and knowledge gaps.

The process used to identify problem areas and the state of product development today was to design a matrix that would facilitate the organization of ideas and information related to available and necessary products. This paper will first report on the workshop's findings on problem areas and priorities among those identified problem areas. This information is presented in a matrix format with definitions. The next section of this paper discusses areas of concern and limitations to solutions to the problem areas. The final sections present the philosophy of the workshop participants on how product development should be approached and recommendations on further work in this area.

### 2. Definition of Problem Areas

There are many individuals, companies, universities, fire departments, and other groups of people working in various capacities on the development of products to assist people with various disabilities in fire emergencies. These products and systems may be focused on providing general safety and also be adequate for groups with certain types of handicaps. Where are the problem areas in product development? Are there serious voids in product development?

There was general consensus that the level of sophistication and development in products far surpassed the level of awareness and education of the general population regarding the issues of fire safety (for the handicapped and for the able-bodied). Most of the products and systems discussed at the workshop are available but not in wide use.

Some of the new or developing products discussed during the workshop are:

- "5-Minute Air Capsule" (Robertshaw Controls Co., Life Support Products Marketing Group, Anaheim, CA.): a plastic bag-type device that is held over the head while escaping from a fire.
- "Porta-Tel" (Specialized Systems Inc., San Diego, CA.): a portable, battery-operated telecommunicator for deaf, hearing- and speech-impaired individuals.
- "Fire Guard" Flexible Wall System (Won-Door Corporation, Salt Lake City, Utah): an automatic folding fire door system which is manually retractable by individuals with limited physical capabilities (individuals in wheelchairs, small children, etc.).
- "Talking Lights" (being developed by Smith Kettellwell Institute of Visual Science, San Francisco, CA.): an infrared light receiver/transmitter system that is being adapted as a navigation and orientation system for the blind with the capacity to transmit three seconds of direct digitized voice communication.
- Smoke detector/alarm system for the deaf and hearing-impaired (Specialized Systems Inc., San Diego, CA.): a system consisting of a smoke detector, sound sensor, receiver box, strobe light, motor vibrator attached to the bed, and a pre-recorded cassette that can be inserted in an adapted telephone. This system is in the prototype stage.

In outlining problem areas, workshop participants concentrated on products--product development as distinct from constraints to rapid commercialization, education, compatibility with codes and standards, and other concerns. These concerns were addressed after identification of problem areas in product development and the ordering by priority of these problem areas.

A three-dimensional matrix was used as a tool to locate problem areas. The axes of this matrix were defined as follows:

X-axis	Occupancy Type
Y-axis	Life Safety Process
Z-axis	Disability Type

#### Definition of Terms

##### X-Axis: Occupancy Type

The definitions used for major occupancy types are "worst case scenarios"--the most inclusive for each category. These are:

- Residential-Single Family: This category includes mobile homes.
- Residential-Multiple Family: includes high-rise, short-term stay (guest in apartments, hotels, and motels), occupants are asleep.
- Commercial: this category includes malls, multi-storied shopping centers, above and below grade.
- Office high-rise, multi-use, above and below grade.
- Industrial: large, heavy industrial complexes.
- Public Assembly: more than 50 persons for a multitude of activities, multi-storied.
- Institutional: includes rest homes and prisons, environments where there are requirements for care, supervision and/or restraint and a high degree of regulation of behavior of occupants.
- Educational: an environment where there are six or more people in a classroom situation, implies supervision, non-sleeping, and includes multi-storied buildings.

#### Y-Axis: Life Safety Process

The major steps in the life safety process that would necessitate product assistance in the form of hardware, software systems, and people were defined as follows. Each step in the process is followed by examples of the types of products considered in filling the matrix.

#### Notification

- of potential victims: smoke detector/sound sensor/motor vibrator alarm systems, heat detectors.
- of service for help: pre-programmed telephones, cassettes, TTY's Porta-Tels, Vial of Life (information on medical problems contained in a vial in the refrigerator).

There was some discussion on the need for a third category under the heading notification to take into account products needed for two-way

communication during a fire emergency. This category was not included in the matrix but could be considered in further work.

#### Action

- in-place defense: small halon extinguishers, fire retardant blankets, tanks of oxygen, 5-minute air capsules, sprinkler systems.
- safe area: fire doors, electrical magnetic door hardware that keeps doors open until a fire alarm is activated and then automatically shuts the doors by cutting off the electricity, lights on auxiliary power in areas of refuge and stairwells, intercom systems.
- evacuation: ramps, specialized transports, inflatable "socks," chutes, modified elevators, toned exit identification, talking lights.

#### After Action Accounting

This term refers to systems for accounting for occupants of a given occupancy type after the fire action. There are currently no systems beyond roll calls, but the possibility of developing some system for quickly determining who might be missing through bugs or other devices was discussed.

Figure 1 presents the workshop's findings on problem areas in regard to product availability referenced to the steps in the life safety process and occupancy type. This table does not take into account specific disabilities. Please note that the symbol "+" does not imply that products are in wide use, that their use is enforced, or that there is no need for further development in all areas; the symbols merely denote relative need. In all areas marked "+" there are additional needs for increased awareness, education in the need for such products and in their use, changes in codes and standards, and changes in building design.

In order to see where the problem areas are in product development, this matrixing process must proceed to the level of specific disabilities. Due to time constraints, the workshop participants were unable to carry this process through for each step in the life safety process, each occupancy type, and each disability type. This process was begun, though, as seen in Figure 2. Figure 2 will be discussed further in the following section.

#### 3. Priorities and Voids

The problem areas indicated in Figure 1 were not referenced to specific disability. In order to further refine an analysis of problem areas, the process begun in Figure 2 should be carried out with a large sample. Some ideas and considerations for doing this are outlined in the recommendations section of this paper. With the information on hand, priorities in problem areas could still be flagged at the workshop.

In Figure 1, the rows indicating the greatest need for product development are: in-place defense, evacuation, and after action accounting. Of these areas, in-place defense and evacuation would seem to warrant the most attention. The only occupancy type which appears to be covered adequately by appropriate products is institutional; the columns which appear to lack appropriate products the most are residential-multiple and public assembly.

Under notification of potential victim in Figure 1, the checks and pluses indicate that there are adequate products already being developed. This is misleading; when the workshop participants looked at notification of potential victim referenced to specific disabilities (Figure 2), they found that for hearing- impairments there is a definite need for development of more adequate products and systems.

Due to time constraints, the only two disabilities looked at for the different occupancy types were hearing and vision, as indicated in Figure 2. It was decided that an in-depth investigation of every step in the life safety process, related to occupancy type and disability type would have to wait for a future survey, but workshop participants did identify those disabilities that would warrant most attention in terms of product development related to each life safety step. A summary is given below:

LIFE SAFETY PROCESS	DISABILITIES MOST IN NEED OF PRODUCTS
Notification	
● of potential victim	Hearing (the need here is systems development for different occupancy types)
● of fire service for help	Movement Manipulation Vision *Voice Size

Action	Movement Manipulation Vision Mental Life Support Size Strength
safe area	Life Support
evacuation	*Movement Manipulation Hearing Vision Mental Life Support Emotional Size Strength
After Action Accounting	all disabilities

A great need in product development that was repeatedly brought out during the workshop was the need for education and training. Without education and training, the cleverest and most appropriate products and systems are useless.

#### 4. Areas of Concern and Limitations

The following considerations were taken into account in workshop discussion of occupancy and building types. There may be other considerations that should be added for future work.

1. Short-term vs. long-term residence.
2. Independent vs. dependent activities of occupants.

A basic limitation to workshop findings was the limited sample size. The small group did facilitate intense concentrated work, but this investigation of product needs should be expanded to include representatives from many diverse fields.

Another area of concern that came up repeatedly during the workshop was constraints or problems with solutions. Problems with solutions to those areas identified as needing work are:

1. Right to risk.
2. Invasion of privacy.

3. Costs of placing the product or system in buildings.
4. Product development and commercialization costs.
5. Enforcement (including codes and standards).
6. Practicality: is it really practical?
7. Maintainability/Reliability.
8. Education/Training
9. Conflicting constraints: if you change a building element to accommodate the handicapped, have you compromised safety? Has an element designed to facilitate egress compromised access?
10. Political priorities (funding).
11. Technology: is the technology available?
12. Is "people" a product?
13. Interface of products with the personal equipment of disabled people
14. Testing
15. Legality

#### 5. Philosophy

The philosophy of the workshop participants regarding an approach to product development is outlined as follows:

1. Universal Design: all products must be developed to increase the fire safety of all persons. For example, lever handles are safer than doorknobs for handicapped and able-bodied people.
2. Consensus Development: there should be direct consumer involvement in all product development projects.
3. The acknowledgement that there exist personal risks.
4. The right-to-risk decision on the part of the consumer must be accompanied with informed choice.
5. Consideration must be given to the possibility of excess consumer dependency on products. For example, overconfidence in emergency breathing

devices may impede escape from buildings.

6. Recommendations

1. There is a need for a rehabilitation engineering product catalog, an exhaustive list of what products are available.
2. Consumer input to the product development process must be increased. This input should be organized and representatives of particular disability groups should present a consensus of the requirements for fire safety products for their group.
3. A specific survey should be developed from the workshop matrix to fill in product information, use factors, and specific constraints to development. This survey could be sent to manufacturers, fire services, ANSI, code representatives, building managers, administrators, legal groups, handicapped groups, architects, engineers, and contractors. A products catalog could be developed from this matrix survey. It could differ from the matrix in this paper in the following ways:
  - a. difference in opinion-- majority, minority--could be expressed in some way, similar to consumer surveys.
  - b. reasons for non-use of products could be isolated: are the reasons for non-use of products on the market because of 1) lack of technology, 2) economics 3) lack of education and training?
  - c. the focus could be on developing a catalog of existing products.
4. Possible solution approaches to problem areas:

● Public Awareness

- a. Serious efforts should be made to approach major technical resources, such as TRW, Hewlett-Packard and NASA (and other manufacturing and research organizations and

agencies) to get involved in R & D in products related to fire safety and the handicapped.

- b. Increase awareness of the problems in colleges and universities (architecture and engineering programs) through design competitions (national or school) and other channels.
- c. Public awareness can be increased through professional associations like the National Institute for Handicapped Research.

● Incentives for Involvement:

- a. Money
- b. Academic credit
- c. Contest

5. Identify and publicize funding of product development. This should be done at all levels: manufacturers, consumers, service organizations. An example of public funding is TTY installment funding through local health districts, and emergency medical services.
6. Continue and increase public education at all levels on the need for products and in training in product use.

Figure I. Product Availability and Need/Occupancy Type/Life Safety Process

		Occupancy Type							
		Residential - Single	Residential - Multiple	Commercial	Office	Industrial	Public Assembly	Institutional	Educational
NOTIFICATION									
● Of potential victim	/	/	+	+	+	+	+	+	+
● Of service for help	/	/	+	+	+	+	+	+	+
ACTION									
* ● In place defense	-	-	-	-	/	-	+	/	
● Safe area	n/a	+	+	+	+	/	+	+	+
* ● Evacuation	/	-	/	-	/	-	+	-	
AFTER ACTION ACCOUNTING		+	-	-	-	/	-	+	+

KEY:

- + Products available; little need
- Products not available; great need
- / Some appropriate products available; some need
- \* Areas with greatest need for product development

Figure 2. Notification of Potential Victim/Occupancy Type/Disability Type

Disability Type	Occupancy Type								(notations from Figure 1.)
	Res-S	Res-M	Com	Off	Ind	Pub	Inst	Educ	
1. Movement	/	/	+	+	+	+	+	+	
2. Manipulation									
3. Hearing	+	/	/	/	/	/	/	/	
4. Vision	+	+	+	+	+	+	+	+	
5. Voice									
6. Mental									
7. Life Support									
8. Emotional									
9. Hidden									
10. Size									
11. Strength									

KEY:

- + Products available; little need
- Products not available; great need
- / Some appropriate products available; some need
- \* Areas with greatest need for product development

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## AUGMENTATION OF THE REPORT BY THE PANEL ON SELF PROTECTION

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I do not feel that the Panel adequately developed a complete definition of the self-protection. The report discusses recommendations for actions by organizations, groups or other people to "help" the disabled (or other) person in his plight, but it fails to state clearly what that plight is and what the individual can do for himself. (The terms his, he, him used throughout this paper are meant to be unisexual and not prejudicial.) My comments here are an attempt to better illustrate the nature and constituent elements of the personal self-protection problem as well as advance a general process to help any individual solve this problem in his own unique setting.

### System Definition

Self-protection, in my view, boils down to a process of problem solving steps that a person takes which leads ultimately to improvement of his chances of survival in a building fire emergency. In the simplest form, the process considers three aspects to the entire system: the individual; the environment; and the interface between the two. Pictorially, this can be shown as follows:

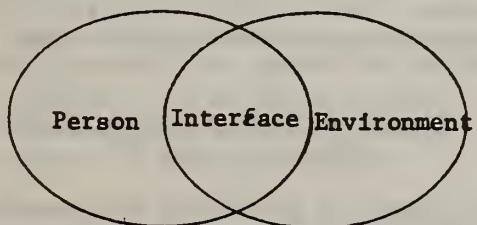


Figure 1

Obviously, the aspect of the system over which each person has the greatest control is himself. Therefore, ways to adapt himself to meet the potential threat should be of the highest priority. Following that, changes

can be made in the environment (buildings, systems, and other people) and finally, changes in, or the development of interfaces (ways of interacting with buildings and building systems through controls, alarms, signs, etc.) can be effected which will enhance survival.

Before listing specific action steps, it is useful to further describe the environment and interfaces in order to understand their respective subcomponents. By expanding the concept shown in Figure 1, the environment can be thought of as having two parts: buildings with related hardware and groups of people other than the person of central focus. Thus:

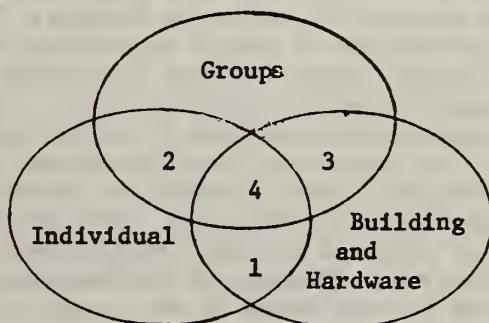


Figure 2

With Figure 2 as a conceptualization of the basic elements necessarily interacting in the building fire self-protection system, anyone can begin a logical thought process of obtaining necessary information about the building and its features; about the other people who will likely be involved and about the interactions or interfaces that will make it all function more effectively. The "Matrix on Problems and Occupancies" (ref. page 3 of the report)\*developed by the Panel clearly lists and categorizes the problems. They fall generally into the three basic circles shown in Figure 2, so I will not enlarge on them. It should be pointed out, however, that each of the interfaces (areas labeled 1, 2, 3 and 4) in Figure 2 are unique and offer insight into the process of seeking solutions.

#### Individual/Building Hardware Interface (Area 1.)

This area represents the ways in which a person, alone, can make use of building or building systems, products or facilities to protect himself. These include: (no specific priorities assigned)

- exit paths/directions;
- exits and exit door hardware;
- refuge areas and access doors/panels;
- elevators/controls;
- escalators;
- alarms/notification;
- 2-way communication with other areas;
- fire extinguishers;
- personal protection devices (Halon gas vessel, 5 minute air bag, etc.);
- sprinkler systems;
- others.

Clearly, the design and construction, placement or location, and appropriateness of each of these items is the heart of this entire issue. However, in this listing, I am referring specifically to an interface of a single person with system or product. The aspect of masses of people interfacing with the building (Figure 2, Area 3) carries its own concerns and is discussed later. Against the single person-building interface is cast all of the functional limitations that can be expected for a total spectrum of people in any building fire emergency. Some may be disabled prior to the emergency, others may be effectively disabled by the emergency. All must be considered in the design of this principal interface area.

#### Group/Building-Hardware Interface (Figure 2, Area 3)

As mentioned earlier, the list of concerns for the single person-building interaction can be mostly duplicated here, except the objective is different. In this case, the objective is the design or arrangement of buildings, systems, facilities, etc. which allows rapid passage of large numbers of individuals, without causing increased threat to any single one. Thus, unlike the previous situation in which a person must be able to act alone, in this interface many people will be present to open doors, operate controls, effect communication, etc. The question posed is: Will the building design allow for this mass exodus without severely jeopardizing any individual's ability for self protection? Immediately called to mind are the instances of crowds pushing, shoving, trampling its members in a survival effort. Thus, here consideration is given to:

- exit door, corridor size and capacity;
- elevator size and location;
- controls and interlocks which prevent recycling and hence evacuation by elevators;
- refuge area size;
- exit paths;
- alternative evacuation routes;
- others.

These concerns are again separate and distinct but closely related to the ways in which people interact (which will be addressed next). In this Group/Building Interface, as before, consideration must be given to a total spectrum of people's ability to function as part of a group flow process. Chronic or emergency induced blindness, physical limitations, emotional disabilities, etc. must be taken into account in the design and planning process.

#### Single person/Group Interface (Figure 2, Area 2.)

A person in a building fire emergency must often rely on another person or on a group of people to enhance his own chances of self-protection. For the disabled person, this interface can be critical, especially since products for effective, total self-protection have not yet been developed. In some ways, this interaction is easier to deal with because the "product" in this case is a human being who can learn, think react and create ways to help another as the emergency demands; a product design must predict the circumstances.

\*See page 65 of this report.

In other ways, the other person as a "product" is not entirely dependable or predictable in an emergency. Thus, this interface addresses the interpersonal concerns that will maximize the help provided to an individual by others:

information and knowledge about specific disability and in general;  
knowledge about a person's own limitations;  
willingness to be "handled" and to explain how it should be done;  
development of "buddies" who will know a person's whereabouts;  
develop and participate in drills to reduce temerity and increase confidence in others for "helping".

These considerations naturally vary according to occupancy type and nature of activity, but they are a vital interface in the self-protection of each individual, no matter the ability or disability.

Individual/Group/Building Interface  
(Figure 2, Area 4)

It is this final area in which all of the others come together in amalgamation (or lack of it) to form a fire emergency plan. It is here that the realities of the building physical plant, with all of its assets and limitations must be carefully analyzed and augmented or countered by a plan of action of the persons contained therein. The plan must consider:

location of hazards;  
effective alternate routes of evacuation;  
assignment of personnel to aid others if possible;  
means of accountability for each person if possible;  
specific input from emergency services personnel;  
alternate actions if the building systems fail;  
others.

Included should be all of the items so often cited as elements of a good site emergency plan. It must be added however, that several items should be stressed for each person to derive maximum self-protection benefit:

Personally review and participate in the plan development.  
Make the plan "live" in ones own mind, at all times, by imagining scenarios that challenge the plan.  
Continually press for building or building system modification if it does not

meet a need.

Engage others when appropriate to discuss the plan or some scenario. Insure that someone else in the building is concerned with improvement of the plan.

Learn more about the characteristics of fire and how to handle and predict its spread.

Be selfish in selecting the locations within a building for long term activities; minimize risk and exposure to hazard.

Take time to review and criticize buildings/plans which lack good fire emergency self protection capability.

Do not patronize (when possible) those facilities (hotels, motels, stores, etc.) that have obviously ignored good fire protection planning -- and tell them and a local fire official why, in writing.

In essence, the best defense in a building fire self-protection struggle is an aggressive and selfish offense. If tomorrow, all persons who spend anytime in buildings would assume the offense, most the problems causing building fire related deaths would soon disappear.

K STREET MALL PROJECT

(Emergency Egress System)

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The California State Department of Rehabilitation, with its major central office located in a renovated and remodeled building at 830 "K" Street Mall in Sacramento, experienced a desperate need for and sponsored the development and implementation of the Project described herein. It is a unique, integrated fire protection system which provides for adequate emergency egress for all members of the Department, not only those in the wheelchairs, but those required to remain and help others in the wheelchairs and those who might have been hampered from evacuating the building in the event of a fire. The heart of the total building system is an automatically deploying flexible fire barrier which protects the elevator shaft and creates a refuge area on each involved floor.

The California State Fire Marshal's Office has closely cooperated with the Project because of major concern at the state and national level for what a local fire official expressed as "frustration" in fulfilling his responsibilities to the handicapped. Basically, the frustration boils down to a struggle between a fire official's legal responsibility to provide emergency protection to all occupants of a given building and a disabled individual's right to risk and equal treatment under the law. The principal factor causing this frustration is the lack of adequate egress systems.

Sections 501 through 504 of the 1973 and 1978 revised Rehabilitation Act mandate non-discriminatory action by an employer on the basis of disability of an individual. In addition, it mandated the removal of all access barriers for the disabled so that, in effect, there would be no handicapping as far as gaining entrance to a job. In reality, this "sword" is double edged, that is, once access is gained to the building for employment or any other purpose, and that access is to floors other than grade level, egress becomes a problem of greater magnitude than access for employers.

Inability to provide egress from or find refuge in a building for a person during an emergency, carries great impact from the standpoint of an employer's personal liability. Considerable concern is being expressed by employers naming this liability as a principal reason for not hiring handicapped people.

### 1. Approach

As experience was gained in dealing with the various constraints and aspects of the problem in meeting the needs of disabled people, it became very clear that many needs of the population as a whole have been neglected or ignored in the general body of data available for building design, fire suppression system design, and emergency planning in general. Once into the investigation and definition of the problem the need for a much more global view for the Project became clear.

Evaluation of the specific needs of a limited population (i.e., the disabled) was broadened to correctly view the needs of the entire population. This is entirely appropriate since it is within the entire population that the Rehabilitation Act mandates the disabled be involved. And it is with the needs of the entire population that some of the largest undefined system constraints exist in trying to define the emergency egress problem for the disabled as described below under Rationale for Systems Objectives.

### 2. Methodology

Through the mandate and support of the Department's Director, Edward V. Roberts, himself a severely disabled quadriplegic, William H. Webster, and Clarence L. Nicodemus conducted limited investigations involving possible alternatives to emergency egress system mechanisms for the "K" Street Mall Building. In addition, an interagency agreement contract was initiated with the Departments of Mechanical Engineering, College of Engineering, and Physical Medical and Rehabilitation, School of Medicine, University of California at Davis in order to establish a "brain trust" group to more thoroughly evaluate problem constraints and alternative solutions. The focus for these investigations was constantly maintained on the specific retrofit needs for the "K" Street Mall Building in order that an immediate solution be found.

### 3. System Objectives

The majority of the Project was conducted then in this manner: the work statement presented to the UC Davis group was in the form of system performance objectives for whatever type of emergency egress system that was to be envolved. These objectives are as follows:

- \* be useable by all human beings in the building at any given time,
- \* be fool-proof, simple to understand and to operate,
- \* be storable for long periods of time without affecting its operational function,
- \* not obstruct normal and emergency pathways as specified by codes,
- \* provide immediate (four minutes or less) safe refuge for all persons, including those with limited mobility,
- \* facilitate or enhance existing emergency systems (i.e., alarms, elevators, stairwells, etc.)
- \* handle wheelchair and all attached wheelchair equipment as well as the wheelchair occupant,
- \* be operable by a paraplegic alone, but may permit an attendant for the needs of a quadriplegic,
- \* be operable by the blind, the deaf, and the mentally disabled without assistance,
- \* accommodate seeing-eye dogs and other assistive devices required for mobility,
- \* have minimum dollar impact on implementation in existing buildings,
- \* require no adaptation or attachments to wheelchairs. (A visitor in the building must be accommodated equally as well as a regular employee in a wheelchair),
- \* not require the ambulatory to remain in the building to assist the non-ambulatory (except in the case of the quadriplegic),
- \* Not rely on any external power sources for its junction.

These performance objectives are considered by the Project to be minimal, but certainly not exhaustive. As work continues, these will be and have been to some extent modified, mitigated, or otherwise met.

#### 4. Rationale for System Performance Objectives

The justification for establishing these performance objectives comes from an analysis of the make up of the total population for any given day in the normal business of the Department of Rehabilitation. Theoretically, this population should reflect generally the same makeup in all public agencies (or private business for that matter) exercising the proper hiring practices.

#### 5. Functional Limitations of the General Population

The nation's population is made up of a multitude of people all with different capabilities and disabilities, handicapped only where there are barriers placed in pursuit of needs. Barriers can be of many variety and description, and need not be hardware or architectural. They can be social, (i.e., language), economic (excess costs), perceptual (non-understood symbology), sensorial (not able to be seen, heard or felt), attitudinal (prejudice), informational (misrepresentation), etc.

All of these barriers exist in one form or other and must be considered in the planning effort for a total emergency egress system. These barriers are not limited to the disabled population, and are handicapping to abled bodied individuals. An excellent example of a nondiscriminatory handicapping architectural barrier is the spherically shaped door knob. Obviously, this shape of door knob handicaps a double upper extremity amputee because there are no functional hands and fingers available to squeeze and rotate the knob. But the same can be said for a fireman with burned hands, a housewife carrying a child, an arthritic elderly person, a stroke victim, a child with grease or water covered hands, etc. Thus, the need to consider the total population as a spectrum of needs, shared by all members, either on a temporary or permanent basis, is a much more realistic design approach of any system, but especially an emergency egress system.

The following chart lists the major (but not all) functional considerations to be taken into account in designing an emergency egress system. These functional considerations are related to specific disabilities and then to project constraints which will hopefully mitigate any handicaps that might evolve for those using the emergency egress system.

<u>Functional Considerations</u>	<u>Lack of Ability to:</u>	<u>System Constraints</u>
Mobility	Move or propel oneself horizontally or vertically.	Safe area refuge must be close by or quickly transported in order to meet a four minute "rule of thumb" smoke environment survival time requirements.
Manipulation	Physically operate controls of various kinds.	All controls must be extremely simple and operable by gross motor activities only; all controls within 40 inches above the floor.
Hearing	Detect alarms and follow audible instructions.	Provide visual and tactile alarm systems.
Sight	Detect and follow visual alarms and instructions.	Provide audible and tactile alarms and instructions.
Perception	Mentally understand controls and instructions (through differing languages lack of education, presence of learning disabilities, presence of developmental disability or loss of other mental integrative capability)	Provide non-language specific instruction and control directions, use clearly understandable symbolic instructions, use psychologically appropriate control instructions (in an emergency a person wants to push on a door to get out, not pull on it).

It would be well here to review a list of "handicapped" individuals which the reader may find surprising when thought of in this context, but which must be considered in planning:

## Children and Visitors

Children and visitors fall into the category of having perceptual difficulties in an emergency in that they are unfamiliar with surroundings. In the case with the former, they may not understand many of the more obvious instructions.

## Pregnant Women, the Arthritic and the aged

Pregnant women, the arthritic and the aged all fall generally into the category of mobility considerations and that in an emergency situation, emotions and psychological effects may render them unable to adequately egress either horizontally or vertically.

## "Totally Abled Bodied" Persons

During an emergency of any sort may become victims of injury which will render them functionally disabled in any one of these five categories.

## 6. Major Results of the Project

Besides the generally beneficial result for the Department of having explored and become involved with the need for emergency egress planning, the Project has developed several very specific results:

### 6.1 Problem Definition

System constraint analysis. As explored briefly above, the Project has brought into focus many of the primary concerns in developing a system which must adequately function for all members of a given building population. These are the kind of considerations that need to be assessed for each building site in terms of retrofit for existing buildings and in terms of new design criteria for future buildings. The use of these analyses are the first step in a realistic planning of emergency egress needs.

In the conduct of the analysis and especially in comparison of objectives with available data, a great number of deficits were found: inadequate code specifications to meet the needs of the total population; inconsistent code requirements; total lack of data for human performance in an emergency or fire environment; contradictory data in codes as compared to research (for example, sprinkler secondary effects on life safety, smoke removal capabilities, toxic gas generation from new materials) and many others.

## 6.2 Model

The bottom line of this effort is the first modeling of a standardized design approach for self analysis and evaluation by other public agencies for emergency egress and life safety planning.

## 6.3 Solution

After considerable exploration and brainstorming of alternatives for a total emergency egress system, it became clear the problem naturally breaks separates into two uniquely identifiable, yet fully integrated parts:

### 6.3.1 Safe Refuge Area on Each Floor Level

This meets the requirement for rapid physical removal from the immediate threat to life safety. For the K Street Mall Building, a system of automatic operable, flexible fire rated smoke and gas barriers were utilized to form safe areas on each floor and to provide an integrated building-wide vertical egress protection system. Installation was completed on October 1, 1979.

### 6.3.2 Vertical Egress Enhancement

With or without a safe refuge area, eventual evacuation of a building involved in fire emergency will be necessary; the refuge area merely "buys" time. The realistic alternative avenues for vertical egress are the elevators and stairwells, both under the "protection" of the refuge area. Both require enhancement to become available to the total population before the system will be complete.

## 7. System Description

The system consists of a safe area constructed on each floor to take maximum advantage of existing egress facilities (stairways and elevators). The location of these safe areas were carefully selected in close cooperation with the State Fire Marshal's Office only after an analysis of the building on a floor by floor basis was made to avoid areas of likely fire potential and to include most direct and secure avenues of egress.

### 7.1 Dual Purpose Placement

The placement of these safe areas was not only for the immediate refuge they provide on each floor, but also the overall protection of the elevators for use by personnel for vertical egress out of the

building or by fire suppression and rescue people entering the building during the fire.

#### 7.1.1 Egress/Rescue

If power is available and the elevator can be used as an evacuation means, then it is protected from contamination by smoke, fire and toxic gases. Therefore, not only has safe refuge been provided, but a major step toward providing a protected entry way for fire suppression personnel has also been accomplished since the largest stairwell in the building also lies in the safe area.

#### 7.1.2 Property Protection

This accomplishes another beneficial aspect of this design, namely that it prevents the transfer of fire and its precursor, hot ignition gases, from leaping from floor to floor vertically through the elevator shaft. A major step has been taken in protecting the property damage of the building through blocking a common avenue of fire transmittal from lower to upper floors.

### 7.2 Flexible Fire Barrier

The key elements restricting the construction of a solid wall refuge, 40 foot long, were the critical need for useable floor space and the interruption of the HVAC air circulation for the lower level (below grade) and second floor open areas.

#### 7.2.1 Unobstructive

Because of these key elements, the deployable flexible fire barrier system was selected. Since no "wall" exists until the barrier is activated by a signal from a smoke detector or other device, both floor space and air flow were not obstructed.

#### 7.2.2 Accessible/Multipass

Its touch activated opening mechanism has been specifically modified into a "crash" panel for use by a person in a wheelchair, thus making the flexible barrier a multipass, accessible port into the refuge area.

### 7.3 Vertical Egress System

Recognizing that the safe area does not meet the need to evacuate a building for a given fire situation, alternatives for vertical egress and evacuation of the building were considered. Two alternatives, centering on the existing stairwell and existing elevator system were selected for

possible enhancement in this specific building. The possible enhancement of the elevator system included the addition of auxiliary electrical power provided by an automatic controlled generator system.

#### 7.3.1 Stairwell Enhancement Concept

In place of the elevator, an alternative system was proposed to make use of the stairwell already in place. Considerable engineering design effort was devoted to developing the feasibility of a gravity powered vertical egress assistance system installation.

The concept is currently in the prototype stage to test feasibility of its operation in the existing stairwell.

#### 7.3.2 Rail System

Very basically, the proposed system consists of a continuous rail beginning at the upper floor landing area and terminating at grade level. The rails serve as a track on which transport modules will be attached.

#### 7.3.3 Transport Modules

These modules are of lightweight frame design that are to be folded and stored in a convenient, nonobstructive manner in each landing. They are designed to be rapidly attached for use by an individual with limited mobility to descend the stairs in a controlled, safe, continuous fashion.

#### 7.3.4 Controlled Decent

The system is designed to transport the entire wheelchair and person in a level attitude under controlled automatic braking with damping and partial manual override for additional speed control.

#### 7.3.5 "Self" Operated

The system is designed so that the individual being transported can control decent himself, or in the case of a quadriplegic, whose upper limbs may be involved to the extent of not being able to manipulate this simple speed control (actually a brake), it can be operated by the attendant or anyone else willing to accompany the individual down the stairs.

#### 7.3.6 Prototype

While the system undoubtedly has a great many difficulties yet to be worked out, its proposed design does meet all of the constraints proposed above as portions

of a total emergency egress system. Its design and prototype model formed the subject of a M.S. Thesis in Mechanical Engineering by Mr. Kevin Allen, under the supervision of Professor J.M. Henderson, University of California at Davis and the authors.

### 8. Conclusion

Three major identifiable results have been achieved within the K Street Mall Project:

#### 8.1 Standardized Approach

A first model for a standardized design for general building structures incorporating emergency refuge areas and life safety evacuation procedures has been developed.

#### 8.2 Inplace System

Actual implementation of a fully integrated and automatic, retrofitted emergency egress system in a multistoried, leased public agency building brought about through cooperation of six public agencies and private building ownership has been accomplished.

#### 8.3 Prototype Stairwell System

Prototype design of a retrofitted, stairwell indwelling, gravity powered, vertical evacuation assistance system as an augmentation or alternative to auxillary powered elevators.

### 9. Need for Further Work

Much additional effort needs to be conducted as a result of the work described above and as a matter of supplying an enormous amount of realistic design data for use by those who may be (or should be) involved in this process in the immediate future. This effort should be channeled along the following general pathways:

#### 9.1 Improvement

Addition of alarms and strobed lights for the deaf; exit and safe area access delineation for low visibility; 2-way communications between safe areas and command center outside building; pressurization and/or fresh air flow into safe areas.

#### 9.2 Testing

This project must confirm the functional viability of the implanted flexible fire barrier system. This will be done on site

to the extent possible, but also in burn tests conducted in cooperation with the California State Fire Marshal's Office, Phil Favro, Director.

### 9.3 Investigations

Many areas of investigation must be pursued to improve future designs and supply data: elevator pressurization, realistic human performance/characteristics in a fire emergency, smoke removal equipment, requirements for highrise building or large open areas, effects on breathable environment of sprinkler interaction on fire and combustion by products, etc.

### 9.4 Education

Many professional groups of people must be advised and made aware of the total building life safety needs of the population and to whom they can turn for information. These groups include public agencies, building designers (architects, engineers, etc.), fire marshals and chiefs, elevator and other equipment designers and manufacturers, the consumer (handicapped and abled bodied) and those who develop and promulgate codes and standards.

The Project is dedicated to continue work in all of these areas as time and funds permit.

### 10. Acknowledgements

Many people and organizations have assisted in many different ways in order to allow this unique development to happen among the major contributors are: Department of Rehabilitation; State of California - Financial support and total commitment; Office of the State Architect - collaboration on space utilization; Won - Door Corporation, Salt Lake City, Utah - willingness to modify; flexible fire barriers to meet project needs; U.S. Fire Administration - encouragement, interest and information; National Task Force on Life Safety and the Handicapped - encouragement to persist.

RESEARCH ON SAFETY FOR THE HANDICAPPED :

PHILOSOPHY AND PRIORITIES.

A.F. VAN BOGAERT  
Brussels.

1. An overall philosophy of fire safety research and development methods needs a preliminary analysis of the safety notion into its components.
2. Safety in a building is a complex notion indeed, depending on
  - the design and construction of the building (constant factor);
  - the contents of the building (variable factor);
  - the occupants' behaviour (highly variable factor).
- 2.1. The users' daily avocations breed a multicellular mosaic of hazards which are constantly challenging safety in the building. Prospect and caution, prevention habits, self discipline, regular checking and maintenance are the positive poles of sound safety behavior. Age, mental and physical condition, education, assimilated information and applied experience together draw the daily safety diagram of a community.
- 2.2. The contents, in their turn, are relative to the occupants' activities and to their mental and physical abilities. These activities often require apparatus, machines, equipment, furniture and stocks that may hide unsuspected fire and associated risks such as smoke and toxic gas generation.
- 2.3. The building, as a solid environment, holds and protects its contents and the human activities inside. In its design and structure it should closely match all the dimensions of these functions, including those which aim at fire safety.

3. Diagram 1 shows an analysis of these components into their respective factors, their interactions and their final impact on the safety level of a building. The synoptic table (Managerial Aspects of Fire Safety for the Handicapped) produced by Panel 5 was based on these considerations.

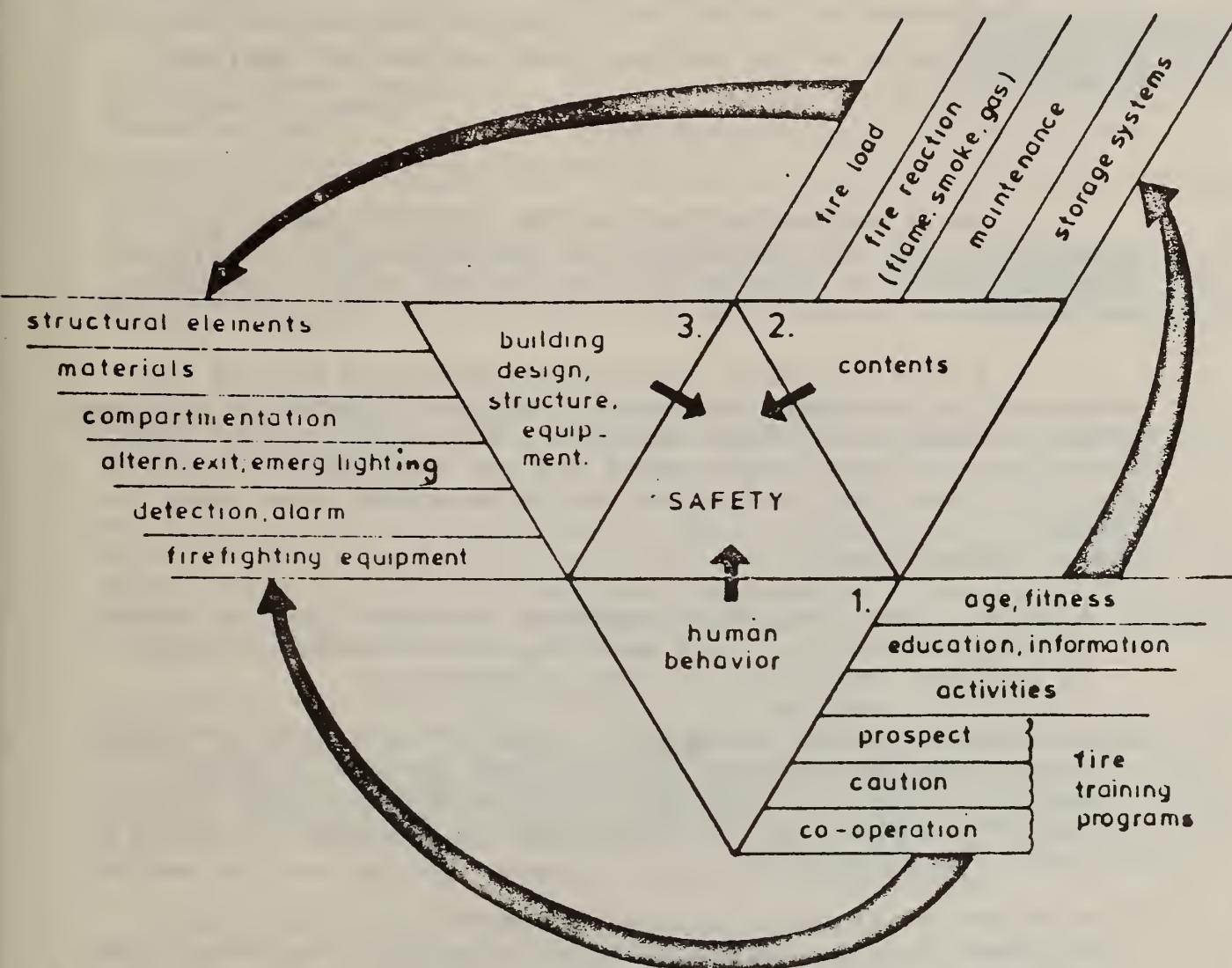


Diagram 1: Components of the SAFETY notion; logical growth philosophy of fire prevention norms.

4. The diagram clearly indicates that all fire safety research and development work should depart from the human factor. This specially applies to fire safety for the handicapped, whose mental and/or physical shortcomings should be

compensated by

- their special education relative to risks, recognition of danger, protection and flight from threat, including personal devices;
- education of normal people as to adequately assist handicapped in emergency situations;
- special arrangements regarding the fire load of the contents in the building;
- special features in the design, construction and equipment of the building;
- adaptation of existing buildings.

5. These compensations require urgent research and organization in both psychological and technological fields, to be confirmed by changes in legislation, norms, standards and codes.

Notwithstanding the complex interrelations of the compensative remedies, some technological research on 3 issues seems to deserve immediate priority, since they are of life importance for both handicapped and non impaired individuals, and since they may need more time to be solved than other items.

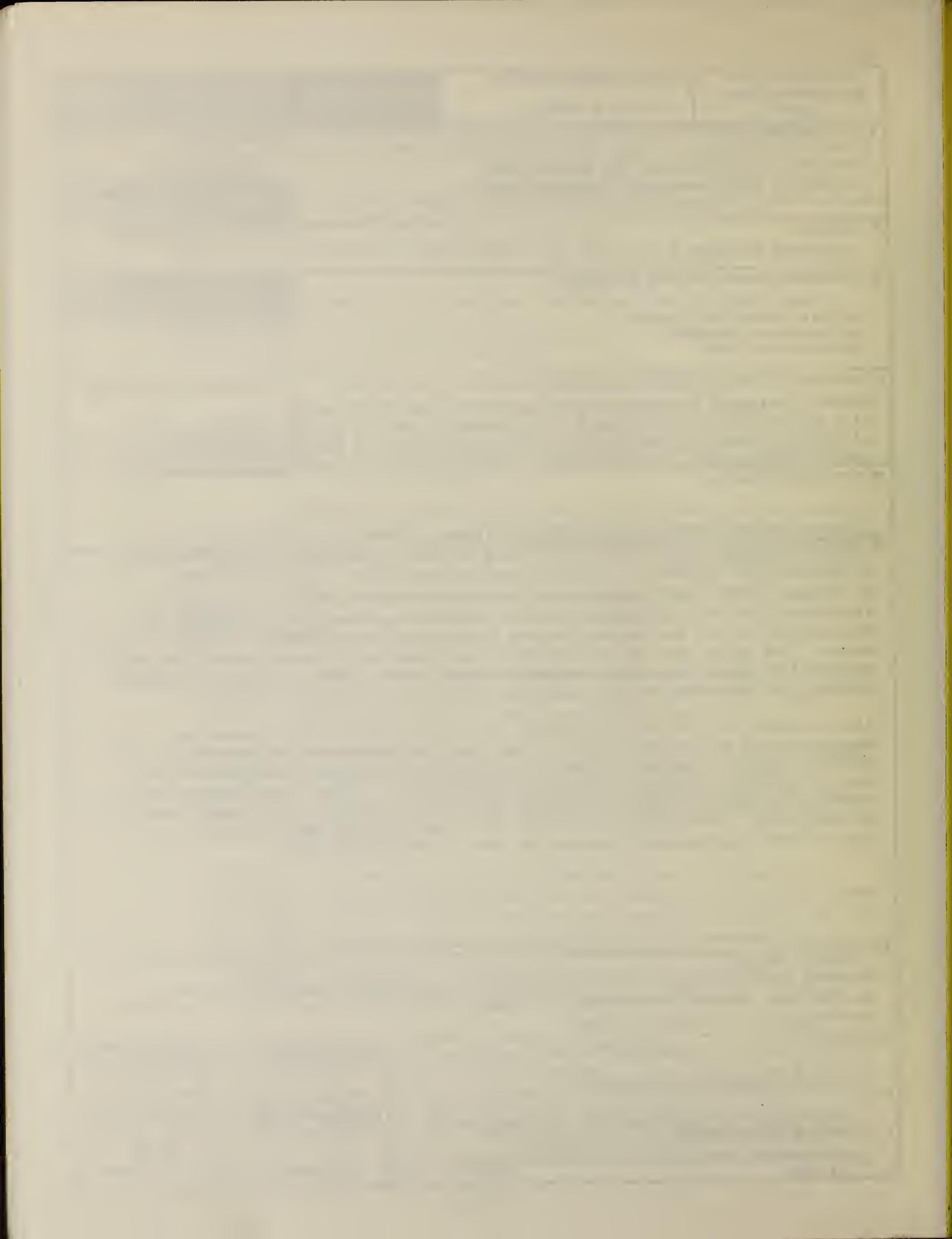
These subjects are :

- 5.1. A smoke - and fireproof protected elevator, kept in action during emergencies, thus enabling non-ambulatory people to evacuate vertically in all circumstances.
- 5.2. An official scale enabling to measure the degree of safety of an existing building (taking into account possible special risks). An appropriate scale should apply to the use of the building by handicapped (especially non ambulatory) individuals. (\*)
- 5.3. A survey of the most appropriate measures to cope with different safety insufficiencies in existing buildings used by normal as well as by handicapped people. The motivation for this priority lies in the fact that the stock of existing (often unsafe) premises holds an enormous number of users (potential victims) compared to the future capacity of the buildings to be erected in, say, the next decade.

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(\*) Note : I cannot at all agree with the vision expressed in the safety value scale produced by panel 3 (Refuge Areas). The lower half of this scale seems to lack some logic : if one is prepared to accept buildings with a safety degree 0 or 1, the scale is quite useless. Moreover, according to the proposed scale, the only unacceptable buildings would be those that have less than no safety value. As far as I know the absolute lower limit of value is zero.

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16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)  On November 26-29, 1979, the National Bureau of Standards hosted a Conference on Fire Safety for the Handicapped where 80 experts discussed the problems of the handicapped in fire emergencies, safety procedures, and hardware that upgrades their safety. The major work of the Conference was conducted by seven panels that met in parallel: overview, alarm systems, refuge, egress, self-protection, management actions, and emergency service actions.				
Six workshops were held in preparation for the Conference during August and September 1979 in the area of life safety for the handicapped in emergencies. The workshops were: codes and standards, emergency preparedness planning, building design, education, consumer interests, and products. Each of the 13 panels and workshops prepared a report containing background information and the recommendations of the panels. This document contains the 13 reports, the speeches at plenary sessions and supplementary comments by some of the participants.				
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)  Building codes; building design; building fires; building management; egress; emergencies; escape; evacuation; fire alarm systems; fire departments; fire safety; handicapped; life safety; refuge.				
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